New York State Museum Bulletin

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No. 279 ALBANY, N. Y. January 1929

New York State Museum

CHARLES C. ADAMS, *Director*

TWENTY-SECOND REPORT OF THE DIRECTOR OF THE STATE MUSEUM AND SCIENCE DEPARTMENT

CONTENTS

	PAGE
Introductory Note	7
A Brief Statement of the Current Status of the Museum	7
Cooperation with State and Other Organizations	9
Allegany School of Natural History	11
Relation of the Museum to Schools and Colleges	12
Museum Attendance	12
Museum as a Bureau of Information	13
Condition of the Exhibitions and Collections	13
Historical and Archeological Collections	14
Staff of the Museum and Its Activities	16
Loss of the State Scientific Reservations	19
Publications and Their Storage	23
Public Lectures and Publicity	23
Drafting, Photography and the Storeroom	24
Museum Printing	24
Financial and Statistical Summary	25
Needs of the Museum	28
Accessions	29
Bibliography of the Staff	35
The Importance of Preserving Wilderness Conditions, CHARLES C. ADAMS	37
Making Fossils Popular in the State Museum, RUDOLF RUEDEMANN AND WINIFRED GOLDRING	47
The Thacher Wampum Belts, NOAH T. CLARKE	53
List of Available Publications of the Museum	59
Index	67

ALBANY

THE UNIVERSITY OF THE STATE OF NEW YORK

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THE UNIVERSITY OF THE STATE OF NEW YORK

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New State State Education Department
The State Museum, February 20, 1928

The Honorable Frank P. Graves,
President of the University and
Commissioner of Education

SIR: I beg to submit herewith the report of the Director of the State Museum for the period from January 1, 1926, to June 30, 1927.

Very respectfully
CHARLES C. ADAMS
Director

THE LEGAL STATUS OF THE NEW YORK STATE MUSEUM

All scientific specimens and collections, works of art, objects of historic interest and similar property appropriate to a general museum, if owned by the State and not placed in other custody by a specific law, shall constitute the State Museum. [*Education Laws, § 54.*]

The Librarian of any library owned by the State, or the officer in charge of any state department, bureau, board, commission or other office may, with the approval of the Regents, transfer to the permanent custody of the State Library or Museum any books, papers, maps, manuscripts, specimens or other articles which, because of being duplicates or for other reasons, will in his judgment be more useful to the State in the State Library or Museum than if retained in his keeping. [*Education Law, § 1115.*]

THE FUNCTIONS OF THE STATE MUSEUM

"The Museum is the natural scientific center of the State government; it is the natural depository of all the material brought together by the state surveys; it is the natural custodian of all purely scientific state records; it is the natural center of the study of the resources of the State as a political unit; it must maintain its capacity for productiveness in pure scientific research—pure science has been the justification of the State Museum from the beginning of its history. * * * In brief, the distinctive sphere and scope of the State Museum corresponds with the scientific interests and welfare of the people within the geographic boundaries of the State.

The truest measure of civilization and of intelligence in the government of a state is the support of its institutions of science, for the science of our time in its truest sense is not the opinions or prejudices, the strength or weakness of its votaries, it is the sum of our knowledge of nature with its infinite applications to State welfare, to State progress and to the distribution of human happiness."—*Henry Fairfield Osborn, an address delivered at the dedication of the New York State Education Building, October 15, 1912.*

THE FUNCTIONS OF A MUSEUM

"A museum is an institution for the preservation of those objects which best illustrate the phenomena of nature and the works of man, and the utilization of these for the increase of knowledge and for the culture and enlightenment of the people.

In addition to local accessories, the opportunity for exploration and field work are equally essential, not only because of considerations connected with the efficiency of the staff * * * but in behalf of the general welfare of the institution. Other things being equal, exploration can be carried on more advantageously by the museum than by any other institution of learning, and there is no other field or research which it can pursue to better advantage.

To aid the occasional inquirer, be he a laboring man, schoolboy, journalist, public speaker, or savant, to obtain, without cost, exact information upon any subject related to the specialties of the institution; serving thus as a "bureau of information."

A museum to be useful and reputable must be constantly engaged in aggressive work either in education or investigation, or in both.

A museum which is not aggressive in policy and constantly improving can not retain in its service a competent staff and will surely fall into decay.

A finished museum is a dead museum, and a dead museum is a useless museum."—*G. Brown Goode, formerly assistant secretary, Smithsonian Institution.*

Museum Committee of the Board of Regents

Wm Leland Thompson, *Chairman*
William P. Baker
William Bondy

State Museum Staff

Charles C. Adams Ph.D., D.Sc.....*Director of the Museum*
Jacob Van Deloo.....*Secretary of the Museum*
Rudolf Ruedemann Ph.D.....*State Paleontologist*
Ephraim P. Felt D.Sc.....*State Entomologist*
Homer D. House Ph.D.....*State Botanist*
Chris A. Hartnagel M.A.....*Assistant State Geologist*
Sherman C. Bishop Ph.D.....*Zoologist*
Douglas B. Young[1].....*Assistant State Entomologist*
Winifred Goldring M.A.....*Paleobotanist*
Noah T. Clarke.....*Archeologist*
William T. Shaw Ph.D.....*Assistant Zoologist*
Neil Hotchkiss M.A.....*Technical Assistant*
Kenyon F. Chamberlain.....*Technical Assistant*
Walter J. Schoonmaker.....*Technical Assistant*
Clinton F. Kilfoyle.....*Technical Assistant*
Arthur Paladin.....*Technical Assistant*
Edwin J. Stein.....*Technical Assistant*
Harry C. Wardell[2].....*Technical Assistant*

Honorary Curators

William L. Bryant.....*Honorary Curator of Fossil Fishes*
Benjamin W. Arnold.....*Honorary Curator of Ornithology*
Harry S. Peck.....*Honorary Curator of Minerals*

Temporary Scientific Appointments

Francis Harper Ph.D.....*Assistant Zoologist*
Clair A. Brown B.S.....*Assistant Botanist*
Robert Balk Ph.D.....*Assistant Geologist*
R. J. Colony B. Ch.....*Assistant Geologist*
Nelson T. Dale Ph.D.....*Assistant Geologist*
A. K. Lobeck Ph.D.....*Assistant Geologist*
Burnett Smith Ph.D.....*Assistant Geologist*
George H. Chadwick M.S.....*Assistant Geologist*
D. H. Newland B.A.....*Assistant Geologist*

[1] Died April 5, 1926.
[2] Transferred March 1, 1926.

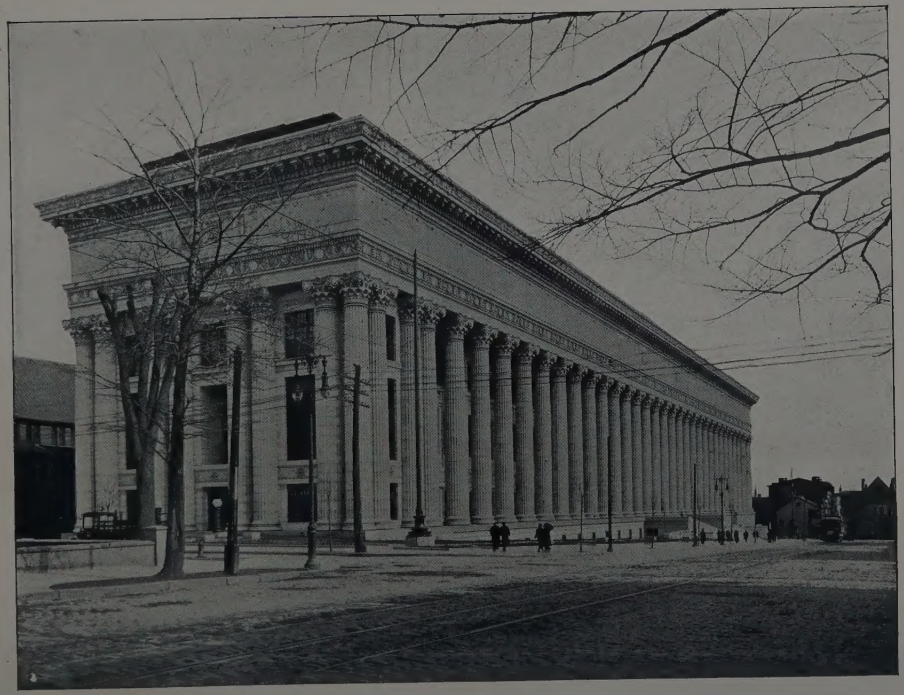

Figure 1 New York State Education Building
On the upper floors is the home of the New York State Museum

New York State Museum Bulletin

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New York State Museum

CHARLES C. ADAMS, *Director*

TWENTY-SECOND REPORT OF THE DIRECTOR

INTRODUCTORY NOTE

This report covers the period from January 1, 1926, to June 30, 1927. For several years these reports have covered the calendar year, but the present one will make the transition to that of the state fiscal year. During the period from January 1, 1926, to May 1, 1926, when the present Director began his duties, the Acting Director, Jacob Van Deloo, had charge, and he has kindly furnished me with the record for that period, so that this report connects directly with the previous report.

A BRIEF STATEMENT OF THE CURRENT STATUS OF THE MUSEUM

The outstanding activities of the Museum since the previous report may be briefly summarized as follows:

1 **Staff of the Museum and its activities.** In addition to the routine, administrative and curatorial duties, the regular educational scientific and economic work of the staff is devoted primarily to conducting scientific surveys of the natural resources of the State, including geology and natural history and their relation to the allied industries and to education.

As a bureau of information, the Museum carries on an extensive correspondence, estimated at about 8000 letters a year. There is a widespread demand for the Museum publications, particularly for those on geology, entomology, and for the bird and wild flower books, which are on sale.

2 **Condition of the exhibitions and collections.** Largely on account of the lack of space, no especially important new collections have been placed on exhibition. New exhibits are needed, as some

have remained unchanged for several years and therefore have lost their freshness. The study collections have been carefully inspected and are in as good condition as their crowded quarters and the storage facilities permit.

3 **Accessions.** Valuable accessions, or additions to the collections, have resulted from the investigations made by the members of the staff, particularly in the field. By gifts and exchanges many valuable additions have also been made, and a few purchases have added to the collections. The larger and more noteworthy gifts are:

From Catharine E. B. Potter, Whitehall, N. Y., the Rear Admiral E. B. Potter Collection of Spanish War and battleship "Maine" relics

From Mrs Carmelita Martin, Ringville, Mass., framed picture of birthplace of Joseph Henry, Albany, N. Y.

From the estate of Mrs John Boyd Thacher, Albany, N. Y., four Iroquois Wampum belts, including the largest one known. This is a very valuable addition to the collection

From Dr August F. Foerste, Dayton, Ohio, a valuable collection of Brachiopod fossils

From Professor M. Gortani, Bologna, Italy, a collection of Silurian graptolites

From Dr Gustaf Tröedsson, Stockholm, Sweden, a collection of Swedish graptolites

From W. P. Alexander, Buffalo, N. Y., a large collection of fishes, reptiles and amphibians from the Allegany State Park

4 **Museum attendance.** Automobile transportation has greatly increased the number of visitors to the Museum. It is estimated that about 200,000 persons visit the Museum annually, the majority of these between June 15th and September 15th, when the number of tourists is greatest. If we allow two hours for a visit, at the rate of 50 cents an hour the public is receiving free $200,000 worth of educational recreation each year from the State Museum.

A large number of the visitors are from outside of the State, and consequently the exhibits are a valuable advertisement for the State. More than 200 groups of school children came by automobile. One group traveled 140 miles. The Sunday attendance is largely local.

5 **Cooperation with state and other organizations.** In addition to cooperation within the Education Department, particularly in the exchange of publications through the State Library, and with the office of the State Historian, the Museum has cooperated with the following:

Joint Legislative Commission, on the location of the Lake Champlain Bridge

The New York State Oil Producers Association, on the Tercentenary of the discovery of oil, at Cuba, N. Y.

United States Bureau of Mines and United States Bureau of Census, Washington, D. C.

New York State College of Agriculture, Cornell University
New York State Department of Agriculture and Markets
New York State Department of Health and State Health Laboratory
United States Bureau of Entomology, Washington, D. C.
United States National Museum, Washington, D. C.
Buffalo Society of Natural Sciences, Buffalo, N. Y.
Allegany State Park Commission, Salamanca, N. Y.
State Council of Parks and Supervisor of Pest Control, New York State Department of Conservation
Colgate University, Department of Geology and Geography, Hamilton, N. Y.

6 Administrative organization. As it is about 90 years since the work now conducted by the Museum was started, and publication has been one of the leading activities of the Staff, a complete set of the publications now covers about 40 lineal feet of shelving. On account of the inadequate provision for storage in the Museum, these publications have been scattered from the basement to the top of the Education Building. Many of the publications are out of print and the available ones are so scattered that it is difficult and time-consuming to secure them for applicants. The quality of these publications is generally recognized as of a very high order and they are therefore worthy of appropriate attention and care. An inventory of these has been begun, and from two to three men have been busy much of the time getting them listed and in order, and many months' work is yet ahead before this inventory can be completed.

The Museum collection of drawings, maps and photographs has become extensive, but on account of inadequate storage facilities these have been widely scattered. New steel filing cases have now been installed and these materials are being concentrated, organized and indexed according to a simple system, and as well with a certain amount of standardization. Only a beginning has been made on this large undertaking, but when once functioning, it will aid greatly the work of the entire staff.

COOPERATION WITH STATE AND OTHER ORGANIZATIONS

The work of a modern scientist and educator is so complex that he is seldom an isolated worker. The State Museum occupies a unique position in the State in relation to its accumulated data on the natural resources of the State, particularly in respect to educa-

tion and the industries. As a result of these conditions there is much cooperative work. Dr Rudolf Ruedemann, State Paleontologist, is editing a two-volume Geology of North America, which involves the cooperation of more than 20 leading American geologists. The result will be a work of great scientific and educational value. The Morrisville quadrangle is being surveyed in cooperation with the department of geology and geography of Colgate University, Hamilton, N. Y. Chris A. Hartnagel, Assistant State Geologist, has cooperated with the Joint Legislative Commission on the location of the Champlain bridge (Legis. Doc. No. 59, 1927); with the New York State Oil Producers Association on the tercentenary of the discovery of oil at Cuba, N. Y., and with the United States Bureau of Mines and the Bureau of the Census on mineral statistics. Dr E. P. Felt, State Entomologist, has cooperated on the corn borer with the State College of Agriculture, and the State Department of Agriculture and Markets; on the Japanese beetle with the Department of Agriculture and Markets; on insects and health with the State Department of Health and the State Health Laboratory; on the relation of insects and winds, with the State Department of Agriculture and Markets; on forest insects with the Supervisor of Pest Control, State Department of Conservation, and the United States Bureau of Entomology; on gall midges with the United States National Museum. Dr Homer D. House, State Botanist, has cooperated on a plant survey of the Allegany State Park with the Buffalo Society of Natural Sciences and the Allegany State Park Commission. Dr Sherman C. Bishop, Zoologist, also cooperated with the Buffalo Society of Natural Sciences and the Allegany State Park Commission on a study of the reptiles and amphibians of the park, with Professor C. R. Crosby of Cornell University on certain studies of spiders, and with the State Conservation Department. Walter J. Schoonmaker, Technical Assistant, has also cooperated in the Allegany State Park work. Dr A. K. Lobeck, Assistant Geologist, cooperated in the Allegany State Park with the Buffalo Society of Natural Sciences on a guide to the local geology.

The staff cooperated with the Editor of the Department in the preparation of the Arbor and Bird Day numbers of the Bulletin to the Schools.

The Director, as a member of the State Council of Parks, has attended every meeting possible and has cooperated, on invitation, with the Allegany State Park Commission and the Letchworth-Genesee Valley Commission, and the Finger Lakes State Park Commission on problems involving educational and museum policies.

The largest single cooperative undertaking has been with the Buffalo Society of Natural Sciences and the Allegany State Park Commission, as discussed below.

The Museum has had hearty cooperation with the office of the State Historian, who has aided materially in our efforts to secure valuable historic objects. The State Library has also cooperated very substantially. It is through the Library that the exchange of Museum publications is conducted, and large additions are made to the Library by this means, to which reference is made elsewhere.

ALLEGANY SCHOOL OF NATURAL HISTORY

The relation of the Museum to the schools and colleges of the State is shown not only by the visitors to the exhibits but as well by its numerous publications, the requests of teachers and pupils for information and advice and the requests for talks and lectures by members of the staff. By these methods the Museum reaches in the course of the year the whole gamut of the educational system from the kindergarten to adult education, and contributes as well technical advice to public officials.

The Regents have expressed their desire to have the Museum do more for our schools, and the staff is willing and eager to do all it can. Therefore when Chauncey J. Hamlin, president of the Buffalo Society of Natural Sciences and a Commissioner of the Allegany State Park, invited the Museum to cooperate with the two agencies which he represents, in conducting a school devoted primarily to the study of outdoor natural history and park management in the Allegany State Park, his offer was heartily welcomed as one more chance to open up a new field for the training of leaders for our schools, colleges and camps, a line of work in urgent need of constructive leadership. Upon the approval of this plan by the Regents, an excellent staff was secured with the cooperation of the Buffalo Society of Natural Sciences. The Park Commission furnished the school buildings, which have a capacity for 50 students, and the Buffalo Society of Natural Sciences administered the dining hall and allied finances the Museum furnishing cooperative supervision of the educational policies and contributing a series of guide books on the natural history of the park region. Through the hearty cooperation of the State Library and the Traveling Library, the Museum and certain friends, a fine working library was furnished to the school. Although the plans were made during the period of this report, the session was held beyond that period, from July 5th

to August 31st. It may be mentioned, however, that the school was conducted with great success under the able supervision of Dr Robert E. Coker, its director. The Museum contributed three handbooks, which were of special value.

RELATION OF THE MUSEUM TO SCHOOLS AND COLLEGES

During the past year more than 200 groups of pupils have visited the Museum, averaging 28 persons to a group and representing 13 counties, Albany, Rensselaer, Columbia, Greene, Saratoga, Montgomery, Washington, Schenectady, Hamilton, Oneida, Herkimer, Orange and Otsego. While the attendance from rural sections dropped off somewhat, the visitors came from even greater distances than in previous years by using the automobile busses. One group of pupils came from Indian Lake Village, Hamilton county, by bus during June. They left home at 5 a. m. and arrived at the Museum at 2 p. m., returning that day. To provide for the trip, special funds were raised during the preceding winter. This shows an appreciation of the value of visiting the Museum and excellent enterprise and spirit.

In addition to the public school pupil visitors, 575 college and normal school students made special visits to the Museum, including some from outside of the State.

A record of the visiting schools, made between May 26 and June 26, 1926, showed that 25 classes averaging 20 pupils each visited the Museum. Most of these visitors were from rural districts. Classes from cities, for the most part from Albany, Troy and Schenectady, averaged between 35 and 40 pupils. An estimate for the past year is about 200 classes and approximately 6000 pupils.

Since the advent of the automobile bus, it has been the custom for teachers within easy reach of Albany to bring their classes to the Museum as a special outing and excursion. Many of these teachers require reports of their pupils on the trip, and copies of these reports which have been sent to the Museum show that the children gain much benefit from these excursions. The best procedure is for the teachers to write in advance to the Secretary of the Museum so that preparations may be made for their arrival.

MUSEUM ATTENDANCE

We have no accurate method of determining the total attendance at the Museum. From June 15th to September 15th there is a large

attendance of automobile tourists, as Albany is so located that great numbers visit here and include the Museum and the Capitol in sightseeing trips. These people are from all over the United States and Canada. The influence of these visitors is thus far-reaching. The visitors during the winter, including Sundays, are largely local.

The total annual attendance is roughly estimated to be about 200,000. This is based on seasonal calculations as follows:

June 15th to July 1st, about	10 000
July	40 000
August	50 000
September 1st to 15th	10 000
Open 30 Sundays	45 000
Remainder of the year	45 000
Total number of visitors	200 000

MUSEUM AS A BUREAU OF INFORMATION

A constant stream of inquiries comes to the Museum from visitors to the exhibits, by telephone calls and through an extensive correspondence covering every phase of Museum work, including such varied subjects as rocks, minerals, fossils, plants, insects, birds, fish, Indian relics and the Museum publications. The geologists are consulted on fossils and rocks, and about road materials, the location of bridge piers and dams. As examples of this, aid has been given to the State Highway Department with regard to the location of bridges, and the Commissioners of the Allegany State Park have consulted the staff on the location of a dam. It is considered one of the important functions of the Museum to assist in these matters in every possible way. In the course of the year perhaps 8000 letters of this character are answered.

CONDITION OF EXHIBITIONS AND COLLECTIONS

The condition of the exhibits and the collections is generally satisfactory, except for limited storage facilities.

The collections have increased as a result of field work by the Museum Staff, exchanges, donations and a few purchases. Important collections of plants, reptiles, amphibians and mammals were made by the staff while conducting cooperative studies in the Allegany State Park with the Buffalo Society of Natural Sciences and the Allegany Park Commission. Exchanges have resulted in valuable fossils new to the collections.

HISTORICAL AND ARCHEOLOGICAL COLLECTIONS

"I warmly sympathize with the ambition expressed in your annual report to have this Museum more than a mere zoologic or scientific museum. It should be a museum of arts and letters as well as a museum of natural history. . . . There should be here a representation of all our colonial and revolutionary life. There should be in this Museum, for the instruction and inspiration of our people, a full representation of American history since the time when New York cast off its provincial character and became an integral portion of the American republic."—*Theodore Roosevelt's address at the opening of the New York State Museum, December 29, 1916.*

The historical collections of the Museum have been accumulating since 1843. In the First Annual Report of the Regents for 1847, reference was made to this early collection. These collections have not grown, however, as their merit would lead one to expect, and yet, when it is considered as a whole, the collection is really of considerable value. In 1853 the Regents published a catalog of the historical collection, but none has been published since. Of course the rather extensive ethnological and archeological collection devoted to the Indians is in reality a phase of history, but this collection was almost wholly destroyed by the fire in the Capitol in 1911. Since that time a new collection has been built up and many of the best materials are now on exhibition. The study series, however, is not extensive. The well-known Indian groups are among the outstanding features of the Museum. Perhaps the most important part of all is the series of Iroquois wampum belts purchased by the State from the Onondaga Indians. In May 1927 the Museum received from the estate of the late Mrs John Boyd Thacher, four more wampum belts, as listed among the accessions, which make the Museum collection the most valuable of its kind in existence from a historical point of view. The Washington Treaty Belt is the largest known piece of wampum. The belts have been described or figured elsewhere in the publications of the Museum (Bulletin 41, by Beauchamp, and Bulletin 125, by Converse and Parker).

The New York State Agricultural Society at one time had a museum but later abandoned it, and the New York State Fair Commission transferred this collection to the State Museum in 1901, where it has been cared for ever since, even in our crowded quarters. In 1920 the Museum sent out a circular to farmers, inviting them to send in historical objects. During the spring and summer of 1924, the Museum had a man in the field collecting household and agricultural objects, so that this collection, particularly the series of plows, is now of special historic value.

Other recent valuable historic accessions worthy of special mention are:

A collection of Spanish War relics made by Rear Admiral William P. Potter, including objects from the battleship "Maine," sunk February 15, 1898. Presented by his daughter Catharine E. B. Potter

A framed picture of the Albany birthplace of Joseph Henry, presented by Mrs Carmelita Martin, through W. F. Jacobs

Hand-made wooden cheese press, shoemaker's bench, shoe lasts and flail, presented by Mrs S. P. Ambler

Roosevelt Medal, from the Woman's Roosevelt Memorial Association, through the late Regent Alexander

Belgian medals and plaque, from the Commission for Relief in Belgium, through Dr C. R. Richards

Framed plate of crow by John J. Audubon, presented by Gilbert M. Tucker

As a part of the historical collection, the Museum has valuable objects used by Dr Joseph Henry, the physicist and first secretary of the Smithsonian Institution. A start has thus been made toward the memorializing of one of New York's greatest scientists. There are also in the collection, objects formerly belonging to Dr James Hall, who more than anyone else was responsible for the real foundation of this Museum. It seems eminently appropriate that the State Museum should give special attention to these illustrious men who have played a leading rôle in state and national development in scientific matters. Every opportunity is being taken to develop this phase. The Museum was therefore greatly pleased when, through the interest of Mrs George R. Boynton of New York City, Mrs Nellie Garretson Gunther became interested in its activities. She is the literary administratrix of Admiral Charles D. Sigsbee, who was commander of the battleship "Maine" at the time of its sinking, February 15, 1898, in Havana harbor. The admiral was born in Albany. It is important to recall in this connection what is not so generally known, that Sigsbee made scientific discoveries and inventions in deep sea research of outstanding merit. That his work, both scientific and naval, should be commemorated in the Museum, is thus very appropriate. Mrs Gunther has pledged (and already has turned over, as this report goes to press), a Sigsbee collection to the Museum, which is of great interest and value.

The Sesquicentennial celebration conducted by the State under the direction of the Regents has aroused great interest this year in New York history, and as a consequence many historic objects have been called to the attention of the State Historian, Dr A. C. Flick, who has cooperated with the Museum in securing such collections,

STAFF OF THE MUSEUM AND ITS ACTIVITIES

"It is essential that this Museum should command the services of many different men for work in many different fields, and that its work should be so closely related to work of the same kind elsewhere that it shall all represent a coordinated whole. This is true of all departments of the work, but especially so of those departments which have a direct utilitarian bearing.

"This Museum, like every other institution of the type, should do everything to develop large classes of workers of this kind. And yet, friends, we must never forget that the greatest need, the need most difficult to meet, is the need to develop great leaders and to give full play to their activities. In the entirely proper effort to develop numbers of individual workers there must be no forgetfulness of this prime need of individual leadership if American achievement in the scientific field is to be really noteworthy. Yet in scientific as well as in historical associations and academies, this fact is often forgotten.

"The really great works must be produced by some individual great man who is able to use to the utmost advantage the indispensable preliminary work of a multitude of other observers and investigators. He will be the first to recognize his debt to these other observers and investigators. If he does not do so he will show himself a poor creature. On the other hand, if they are worth their salt they will be proud to have the great architect use all the results of their praiseworthy and laborious and necessary labor in constructing the building which is to crown it."—*Theodore Roosevelt's address at the opening of the New York State Museum, December 29, 1916.*

In recent years there has been much discussion in scientific literature about the advantages and disadvantages of organizing scientific work and workers. As is usually the case in such problems, the practical difficulty is to strike the mean between enough freedom to allow real ability not merely to exist but to thrive, and enough organization to prevent unnecessary waste of ability and resources on the part of the less able and efficient.

The method of having a definite written plan has many advantages. It encourages definite ideas as to aim and procedure on the part of the worker, and aids planning ahead and cooperation on the part of the other officials. In general, other things being equal, it seems the best general procedure to concentrate on a few *definite projects* rather than to dissipate ability and the funds of an institution along many lines of indefinite action. For this reason an effort has been made to encourage the project system, and the work of the Museum is as much as possible being conducted upon this plan.

For several years the United States Department of Agriculture has published a volume outlining the research and other projects conducted by the Department. An adaptation of this general plan,

applied to our work, gives the following general headings for dealing with various subjects:

Project No. (Subject.)
Scope. (To determine etc.)
Status. (Its present stage etc.)
Plans. (For future etc.)
Finances.

The following is a brief sketch of the major work of the Scientific Staff, in addition to the usual office and administrative work:

Geology. The paleontological work has been devoted to the continuation of studies of graptolites, the editing by Doctor Ruedemann of a comprehensive work by about 20 authors, on the Geology of North America, and field work on the Lowville and Troy Quadrangles. His second report on the Utica and Lorraine formations also appeared as a Museum bulletin.

In spite of a period of ill health, Winifred Goldring has made considerable progress on a popular introduction to paleontology, and progress has been made on the Berne quadrangle, which includes the John Boyd Thacher State Park. Superintendent John H. Cook, of this park, who is an experienced geologist, will cooperate in this.

In the field of economic geology, the report by Mr Hartnagel on mining and quarry statistics from 1919–24, brings that subject to date and in readily accessible form (Bulletin 273). This report shows that mining and quarry products exceed in value $100,000,000 each year, an increase of $25,000,000 since 1920. This is about twice the value of these products from all of New England.

Dr A. K. Lobeck completed the field work and finished his popular report on the geology and physiography of the Allegany State Park region and has produced a very valuable guide to that region. Geological reports have appeared by Doctors C. H. Smyth jr and A. F. Buddington, on the Lake Bonaparte Quadrangle; by Dr F. Holzwasser, on the Newburgh Quadrangle and Vicinity, and by Dr W. J. Miller, on the Lyon Mountain Quadrangle.

Insects. Doctor Felt reports the discovery of three very injurious beetles in southeastern New York—the Japanese beetle, the Asiatic beetle and the Japanese serica. The European corn borer injury continues and demands serious attention. A new and serious type of injury by the Pales weevil to young pines has been demonstrated. It requires constant vigilance to protect our crops from such harmful insects. Studies of the dispersal of insects by winds and the

study of gall midges have been continued. Great numbers of wind-dispersed insects have been taken from the roof of the Education Building and the results have been new and surprising. H. L. Viereck's report on the Hymenoptera of the Museum collections has been completed. A concise system of indexing the insect collection has been started. Kenyon F. Chamberlain has begun work on a descriptive catalog of the beetles of the State and an intensive study of Lupine insects.

Plants. Doctor House has conducted a field study and prepared a report in cooperation with W. P. Alexander on the flora of the Allegany State Park. This is to serve as a guide to the plants of the region. Field work has also been continued in the Newcomb region of the Adirondacks and at the eastern end of Oneida lake. Neil Hotchkiss has assisted greatly in the herbarium and has made material progress on both the field work and his report on the vegetation of the Tug hill region, west of the Adirondacks.

Animals. Doctor Bishop has devoted considerable time to field study in several parts of the State and has prepared a report in cooperation with W. P. Alexander on the reptiles and amphibians of the Allegany State Park. His paper on the habits and development of the Mudpuppy, appeared as a Museum Bulletin. He has continued his investigations in cooperation with Professor Crosby, on the spiders of the State.

Dr Francis Harper continued his study of the mammals of the region about Mount Marcy, in the Adirondacks. Walter J. Schoonmaker has given special attention to the local mammals, particularly the Woodchuck, and devoted a limited time to field work in the Mount Marcy region and in the Allegany State Park. Professor J. W. Bailey has completed a report on the myriapods of the State, based largely on the collections of the Museum.

Dr W. T. Shaw has begun an intensive study of the life history and habits of the Skunk, one of the most valuable fur-bearing animals in the State, and about which we have very little detailed knowledge.

Archeology. Noah T. Clarke has been largely occupied with cataloging the study collection. He has also indexed the archeological articles printed in the Museum publications so that these are easily accessible. Life busts of a number of Indians have been bronzed and placed on exhibition.

We wish to record with regret the death during the interval of this report of three former members of the Museum scientific staff.

Dr James Furman Kemp died November 17, 1926. Doctor Kemp was for many years a member of the staff and was one of the three pioneers on the Precambrian Adirondack geology, the other two being Professors Smyth and Cushing.

Dr Charles D. Walcott died February 9, 1927. Doctor Walcott, as a young man, was an assistant of Dr James Hall on the Museum staff. In this, his first scientific position, he secured important scientific training.

Douglas B. Young, Assistant State Entomologist, died April 5, 1926. He filled this position very efficiently for 24 years.

At this place mention should also be made of the loss of Regent Charles B. Alexander, Chairman of the Museum committee of the Board of Regents. Regent Alexander had been chairman of the Museum committee since 1913, and gave considerable time to the welfare of the Museum. He died on February 7, 1927. He has been succeeded by Regent Wm Leland Thompson, as chairman.

LOSS OF THE STATE SCIENTIFIC RESERVATIONS

"There must be ample research in the laboratory in order even to present those problems, not to speak of solving them, and there can be no laboratory study without the accumulation of masses of dry facts and specimens.

"I also mean that from now on it is essential to recognize that the best scientific men must largely work in the great out-of-doors laboratory of nature. It is only such out-of-door work which will give us the chance to interpret aright the laboratory observations."—*Theodore Roosevelt's address at the opening of the State Museum, December 29, 1916.*

The preceding Director of this Museum, Dr John M. Clarke, after years of effort secured private funds for the purchase of certain reservations which were primarily to be preserved for their scientific and educational value. These he aptly called the "Out-of-Doors Museum." This gave to the State a small and unique system of reservations somewhat comparable to the federal national monuments, in that they were intended to be preserved from economic exploitation or from the overuse or abuse, to which certain park areas are subjected. No other state had such a series of such reservations. As Doctor Clarke said, *"They have not been taken over for park purposes but to preserve their natural attractions unimpaired."* This aim corresponds to the purpose of the national parks, which were intended to be passed on "unimpaired" to future generations, which has come to mean in a wild state. With our increasing population, its industrialization and concentration in cities, there has been

an increased demand for public parks and forests for recreation. Forest policies for economic purposes have not yet clearly recognized the value of such wild and natural reservations. As might be anticipated, the main difficulties of preserving these scientific and educational reservations have been to provide for their *maintenance* and to select the correct sites. These reservations, formerly under the custody of the State Museum, were as follows:

1 Clark Reservation, 115 acres, near Jamesville, N. Y.
2 Chittenango Falls Park, 22 acres, near Cazenovia, N. Y.
3 Lester Park or Cryptozoon Ledge, 3 acres, near Saratoga Springs, N. Y.
4 Stark's Knob, 4 acres, near Schuylerville, N. Y.
5 Squaw Island, Canandaigua Lake

Clark and Chittenango Falls reservations were transferred to the custody of the Central New York Park Commission, with the reorganization of the State Government (State Departments Law, chapter 619, Laws of 1926) on January 1, 1927. The remaining reservations were transferred to the Conservation Department.

Had these reservations been given *in trust* to the State Museum, this transfer could not have been made, although in the cases of Clark Reservation and Chittenango Falls Park there was much to be said for them as parks, rather than as reservations, because the geologic features, for which the Clark Reservation was primarily set aside, could be maintained in a park, although this is not equally true of the plants and animals of an area used as a picnic grounds and for intensive park purposes.

The loss to the Museum of these Reservations is significant because it reveals anew a condition deserving of public attention. Primeval nature in eastern America is being destroyed so rapidly that even today one may have to travel hundreds of miles to see a patch of virgin woods, and thousands of persons do not even know at sight how to recognize virgin conditions of nature. In this respect we are fast approaching European conditions, where there is little left of undisturbed nature. We can, however, learn from their mistakes if we will begin in time. Let us consider first of all:

Virgin conditions. These conditions are given special emphasis because of their rapid extinction, inert public interest in them, their rare beauty and unique value of such regions from the esthetic, educational and scientific points of view.

Wild, undisturbed nature has a uniqueness comparable to that of the works of the greatest literary men and artists, and any change

made by man injures them to some degree, just as it would to "improve" upon the work of Shakspere, Muir, Leonardo or Rembrandt. We need some "unimproved" samples of wild nature—just as nature made them—because of their *unique qualities*. Their esthetic value is recognized at sight, as can be seen in most of our national parks, and their educational values are equally important. These areas may be looked upon in part as the historic remnants of ancient America as the pioneers first saw it. Our early pioneer life was molded in this setting. Our entire school system from the kindergarten to the university needs these historic relics for teaching purposes; our naturalists will always find a unique charm and innumerable problems for study in such conditions; and finally they are needed for a high grade of recreation.

Some large tracts of land are urgently needed, particularly in those regions where national parks can not and should not be established. There should be set aside in the national and state forests and in state parks—which are yet fortunate enough to possess virgin conditions—the best available samples of these conditions, where they can be preserved indefinitely unharmed for future generations.

The preservation of these areas is particularly difficult because of the frequent tendency on the part of public officials to make a showing of "improvements," and because of the belief that such "improvements," so called, will not injure such areas or reservations. The rotten logs, dead trees and similar features that irritate the formal park official or economic forester, are essential in a wild natural history preserve, as they are a part of the natural system which it is primarily intended to preserve. In such a preserve the greatest difficulty will therefore be to "leave it alone," and to prevent its destruction by allowing the public, unsupervised, to overrun and destroy it, as is being done even today in parts of some of the finest national and state parks.

Restored areas. In regions which have already lost their natural conditions, an effort should be made to preserve samples of the best remaining and least injured examples, in order that such areas under competent supervision may be allowed *to return to nature* and ultimately become valuable substitutes for original conditions. This is particularly true where all the surrounding regions have become intensely modified, artificial and formal.

At present, as has been said, we have no adequate recognition and supervision for the preservation of reservations that are primarily of scientific and educational value, and requiring scientific and educational supervision. Examples of tidal swamps, sand dunes, cat-tail

swamps and other representative natural environments are desirable for such reservations but today are not wanted as parks. Such areas should be supervised differently than the conventional rural or urban parks and forests, and require a special staff, composed of competent naturalists, whose special knowledge is necessary not only to care for such property but to enable them to conduct investigations on such reservations, as this is one of their main uses. Furthermore, part of such a staff might act as guides for the visiting public. Such areas, carefully selected in various parts of the State, in order to preserve enough important samples, would be of the greatest importance from an educational and scientific point of view and would truly be "outdoor museums." Parts of these, particularly when properly labeled, would be wild plant and wild animal gardens.

There are additional reasons why the Museum needs land for conducting its own investigations of the native plants and animals. The State Entomologist's office, even after 53 years of valuable existence (established in 1874), has not a single acre of land upon which to conduct experiments on injurious insects, or a field laboratory of any kind. This was not remarkable fifty years ago, but today this is distinctly not in accord with modern standards. In the spring of 1927, when the Museum was making investigations on the habits and life history of the Skunk, it was necessary to rent land in order to care for these animals. Until suitable tracts of land are secured for the Museum, its work will be seriously hampered and can not be conducted as it should be.

During the past 25 years there has been a wonderful development of educational and research institutions in this country. Some have grown through private endowment, others are financed by the State or the federal Government, and still others by a combination of both public and private support. Strange as it may seem, this cooperative plan has been one of the most successful. Not only do colleges, universities and research institutions gain by these methods, but parks and historic and scientific reservations have been established and conducted by these same methods. Aside from the Adirondack and Catskill parks, in the main the early development of the parks, historic and scientific reservations in this State was by the private method, and these have grown into the present State Park and reservation system. The Palisades Interstate Park on the Hudson is a fine example of this kind of development.

In that case large private funds were turned over to public officials, the income of the funds providing for the development of that park area. Similar funds, in trust, given or bequeathed to the Board of

Regents, for the development of the State Museum, would permit the purchase of natural history reservations, their maintenance and the production of exhibits, *in advance* of the slower moving public sentiment needed for legislative support, and would allow the Museum to develop, as it should, a credit to the wealthiest state in America.

Particular attention should be called to the fact that several of the most striking and beautiful exhibits in the Museum, as for example the Indian Iroquois Groups, and the scientific reservations, were not financed by the Legislature but by the gift of funds secured by the former Director, Dr John M. Clarke.

To those who recognize the need of such reservations, the following suggestion is made.

Gifts up to 15 per cent of the net income and all bequests to the Board of Regents of The University of the State of New York, *in trust* for the State Museum, are exempt from federal taxation, under the Federal Revenue Act of 1918.

PUBLICATIONS AND THEIR STORAGE

A single set of the various Museum publications requires 40 lineal feet of shelving, the result of about 90 years of productive activity. Many of these publications are now out of print or are very rare. At times in the past the editions were large, but with the increased cost of printing there has been a great reduction in the size of editions. As the result of various influences, particularly the lack of adequate storage facilities, these publications have been stored from the basement to the top of the Education Building so that it was often impossible to know what publications were in stock or where they were.

For many months now, from two to three men have been devoting most of their time to taking an inventory of these publications, sorting and arranging them. Storerooms and shelving have been built to the extent of several thousands of lineal feet, and a corresponding amount of the publications have been inventoried. The list of available publications, accompanying this report, is a provisional list based upon this work.

PUBLIC LECTURES AND PUBLICITY

Frequent calls are made upon the staff for talks and lectures. The record shows that seven speakers have made 73 talks and have thus reached about 8900 persons. These talks have been given in 17 counties, as follows: Albany, Columbia, Erie, Essex, Fulton,

Greene, Jefferson, Kings, New York, Oneida, Onondaga, Orange, Otsego, Rensselaer, Rockford, Saratoga and Schenectady. Seven of these talks were given outside of the State. Press notices have been prepared on various subjects, particularly on economic entomology, and one radio talk was given on the corn borer.

DRAFTING, PHOTOGRAPHY AND THE STOREROOM

On account of the prolonged and extensive series of publications of the Museum, the accumulated scientific drawings of fossils, insects and other objects are very extensive. It has not yet been possible to estimate their number. Later, with the rise of photography as a means of illustration, such materials have accumulated at a rapid rate. Of the photographic series there are about 5000 negatives and prints and 800 lantern slides. The geological reports have required many maps and line drawings. This accumulation has never been concentrated, systematically arranged and indexed.

The dark room facilities have been inadequate but conditions have been improved considerably.

New cameras of various types have been purchased and other valuable equipment for printing have been acquired, so that the quality of the work by the staff and field parties has been greatly improved. Such equipment not only improves the value of our official records and files but the quality of our publications as well.

Steel filing cases, suitable for negatives, lantern slides, maps and drawings, have been purchased, and the concentration of these materials has been started. Standard photographic equipment, supplies and methods of recording field data have been worked out and are under way. It will, however, require a few years to organize this collection properly with the present limited staff.

All photographic equipment has been placed in charge of Mr Stein, as have also the scientific equipment and supplies, in order to have a central office and storeroom for such materials and a definite system of caring for them and locating responsibility. Additional aneroids, hand levels and other scientific equipment are being acquired as rapidly as funds will permit.

MUSEUM PRINTING

"After all it is the written word that lives."—*Dr W. M. Beauchamp.*

No modern public museum can retain a staff of high quality, cooperate with the leaders in its field and maintain public confidence and respect without devoting much attention to printing in both

popular and technical form the results of its investigations and activities. Adequate funds for printing are always difficult to secure. For several years these funds for the Museum have been very inadequate, so that there is a considerable accumulation of manuscripts on hand. Some manuscripts have been on hand for many years. When we consider the inadequate payment for most scientific work, delayed publication is an injustice that authors, with good reason, strongly resent. Therefore prompt and satisfactory publication is one of the best possible means of securing hearty cooperation among the scientific men of the State. Furthermore, by this same method, experts are attracted to the State who otherwise would work elsewhere.

The publications of the State Museum are a valuable means of building up the State Library. Not only are these publications sent to libraries throughout the State but to other states as well and abroad in large numbers. By this means the publications of other states and organizations received in exchange total in the course of a year thousands of pamphlets, reports and books, which, if purchased at current market price, would amount to several thousands of dollars. The present mailing list of the State Library, to which the publications of the Museum are sent, amounts to over 700 addresses.

A list of the publications of the Museum and of the members of the staff accompanies this report and is given in the bibliography.

FINANCIAL AND STATISTICAL SUMMARY

As the period of this report covers a year and a half, the following financial and statistical summary is given for the two fiscal years involved, but in greater detail for the year 1926–27.

The Museum budget. The following budgets do not include the cost of heat, light, janitor service, orderlies, carpenters, painters and elevator men. Certain supplies also, are furnished by the Education Department, such as postage, stationery, express, freight, ordinary drayage, telegraph and telephone, and are therefore not included in this budget. Gifts of funds, in addition to that derived from the state appropriation, are indicated.

The traveling expenses have been budgeted, so that each member of the scientific staff is able to plan his work to the best advantage. As rapidly as possible it is hoped to extend this system to all expenditures.

Appropriations and Funds for Fiscal Year July 1, 1925—June 30, 1926

Salaries:	
Administrative staff	$8 500 00
Scientific staff	18 300 00
Scientific assistants	10 940 00
Clerical, labor etc.	8 580 00
Total salaries	$46 320 00
Equipment and supplies	$5 000 00
Temporary services (scientific)	3 000 00
Traveling (of which not to exceed $200 is available for out-of-State travel)	2 300 00
Printing	8 000 00
Supplementary appropriation for printing 10,000 copies of the portfolio of the colored plates of Birds of New York (Laws of New York 1925, chap. 659)	10 000 00
Special fund for Sunday opening	1 020 00
Total appropriation	$75 640 00

Appropriations and Funds for Fiscal Year July 1, 1926—June 30, 1927

Salaries:	
Administrative staff	$9 000 00
Scientific staff	23 840 00
Scientific assistants	8 000 00
Clerical, labor etc.	8 760 00
Total salaries	$49 600 00
Equipment and supplies	$5 000 00
Temporary services (scientific)	3 000 00
Traveling (of which not to exceed $200 is available for out-of-State travel)	2 300 00
Printing	8 000 00
Special fund for Sunday opening	1 020 00
Total appropriation	$68 920 00

The expenditures utilize these funds so fully that the balance unexpended is negligible.

Statistical summary

Estimated number of visitors a year	200 000
More than 200 groups of school children and student visitors (annual estimate)	6 000
College and normal school student visitors (current fiscal year)	575
Cooperation with organizations (current fiscal year)	12
Complete set of Museum publications, in lineal feet	40
Museum file of photographs, negatives and prints (estimated)	5 000
Lantern slides (estimated)	800
Correspondence of the staff, letters (annual estimate)	9 000
Number of persons reached by public lectures and talks (current fiscal year)	Over 8 900

Directory Data

Name of Museum: New York State Museum
Location: Albany, N. Y., U. S. A.
Name of Director: Charles C. Adams
Name of secretary: Jacob Van Deloo
Date of founding: The Museum is the outgrowth of state surveys begun in 1835; formal organization of the Museum was in 1843.

Open to the public. Open week days from 9 a. m. to 5 p. m., and Sundays from 2 to 5 p. m. from October 4 to April 25, 1925–26, 30 days; from October 3 to April 24, 1926–27, 30 days

Total number of hours open to the public a year		2 518
Number of members on scientific staff	9	
Number of clerical employees and others	13	
Number of part-time persons (scientific)	9	
Total staff	31	

Salary schedules, 1926–27

Director	$6 000
Secretary	3 000
Scientific professional staff	$1 440 to 4 250
Technical assistants (nonprofessional grade)	$1 380 to 2 000

Hours and vacation

Hours of work a week	36¼
Vacation allowance, 24 working days of 6¾ hours, and all legal holidays	

Conclusion

The above tables show that the average attendance of the Museum is about 200,000 persons a year. This is an excellent attendance in a city with a population of about 118,000. The Museum is open on the average 2500 hours a year. The average visitor spends two hours in a visit in the Museum, and may make several visits in the course of the year. More than 200 groups of school children, averaging annually about 6000 pupils, are included in the total, and about 600 students of college grade. The public lectures by the staff reached during the current fiscal year about 9000 persons.

If we calculate the value of these visits at the rate of commercial recreation or educational recreation at 25 cents an hour, and allow an average of two hours for a Museum visit for 200,000 visitors, we have 400,000 hours of attendance, which at 25 cents per hour make $100,000 worth of educational recreation a year furnished the public free. If this is calculated at 50 cents an hour the amount is $200,000 and this represents, of course, only a part of the activities of the Museum. Yet this amount is about three times the amount of the total appropriation made each year (about $70,000) for the Museum.

NEEDS OF THE MUSEUM

The New Museum Building. The preceding sections of this report have told of the present status of the Museum but has not attempted the broader orientation of the Museum and its relation of the State as a whole, or plans for its future. The people of New York State are now becoming conscious that the State Government can not keep pace with the tremendous development of the State as a whole unless it looks ahead for several years and plans definitely for the future. State planning for parks, highways and schools should also involve state education and research, as conducted by the State Museum. In providing an adequate office building at Albany for the State Government, Governor Alfred E. Smith realizes the crowded condition in the Education Building and has repeatedly advocated in public a new State Museum Building.

Such a building should provide ample space for exhibiting all phases of the natural resources and history of the State, many of which are today inadequately or wholly unrepresented in the exhibits of the Museum. As a rule well-lighted offices and laboratories and ample storage space are generally neglected in museums, and yet they are of major importance. Ample space should also be made to house the accumulations of historic and industrial materials. Vaults should provide space for the more valuable scientific and historic documents and objects.

Other Needs of the Museum. In addition to the proposed new building the following require emphasis:

1 Adequate *salaries* for the staff, and *increases* in their number. The leading staff positions should, as soon as possible, be placed on at least a $5000 basis. Corresponding positions elsewhere are paying considerably more.

2 Additional funds are needed for *printing* to clear up long standing obligations, and to build up a series of popular and scientific publications helpful to the schools and industries of the State.

3 Temporary fire proof *storage space* to make safe the accumulating collections until the proposed new building is built.

4 Acquirement in trust of *land and endowment* for the establishment and maintenance of *scientific and educational reservations* as out-door museums and for research in the field under controlled conditions.

LIST OF MUSEUM ACCESSIONS FROM JANUARY 1, 1926–JULY 1, 1927

Accessions are new additions to the Museum. These are classified into the following groups:

1 By gifts; objects presented to the Museum

2 By exchange; for other Museum materials etc.

3 By purchase; payment from the Museum budget

4 By the staff; collected by the staff during official duties of any kind

5 By transfer, from other state departments, from within the Education Department, or from other divisions of the State Government, as provided by law

By Donation

Alexander, William P., Buffalo, N. Y.
Collection of reptiles, batrachians and fishes, Allegany State Park, N. Y.
Allen, R. B., Fulton, Ky.
Maple galls, Fulton, Ky.
Allis, Lewis, Milwaukee, Wis.
Oak galls, Milwaukee, Wis.
Ambler, Mrs Silas P., Central Nassau, N. Y.
Hand-made wooden cheese press
Shoemaker's bench and shoe lasts
Wooden flail. All from Central Nassau, N. Y.
Armstrong, N. M., Poughkeepsie, N. Y.
Japanese beetles, Purchase, N. Y.
Arnold, Benjamin W., Albany, N. Y.
2 Gastropods, Manitoulin Isle, Can.
Balk, Robert, New York City
4 Fossils, Dutchess county, N. Y.
Blanchard, F. N., Ann Arbor, Mich.
3 Amphibians, Louisiana
Slimy Salamander, Alabama
Breunich, B., jr, North Pelham, N. Y.
Oriental beetle grubs, North Pelham, N. Y.
Britten, W. F., Stillwater, N. Y.
Aphids on Norway maple, Stillwater, N. Y.
Brown, Clair A., Albany, N. Y.
2 Amphibians, Mount Rafinesque, N. Y.
Brown, Clark, Albany, N. Y.
2 Cryptozoons, Saratoga, N. Y.
Burrell, A. B., Peru, N. Y.
Fir saw-fly larvae, Peru, N. Y.
Bush, C. W., Utica, N. Y.
Lined corn borer larvae, Utica, N. Y.
Chicago Crucible Company, through W. MacFadden, Chicago, Ill.
2 Graphite crucibles, Chicago, Ill.
Cleaves, H. H., Albany, N. Y.
Granite, South Mountain, Ga.
2 Amphibians, Colorado
White-footed mouse, Colorado
Commission for Relief in Belgium, through C. R. Richards, New York City
2 Belgian medals
Belgian war orphans plaque

Cooper, G. A., Hamilton, N. Y.
13 Crinoids, Hamilton, N. Y.
Countryman, Edward, Buffalo, N. Y.
3 Snakes, Allegany State Park, N. Y.
Cutler, George, Champlain, N. Y.
Polished ornamental malachite
Dietrich, H., Appleton, N. Y.
Collection of beetles, Appleton, N. Y.
Eaton, E. H., Geneva, N. Y.
Rattlesnake, Honeoye Lake, N. Y.
Ferguson, W. C., Hempstead, N. Y.
158 Plants, Long Island, N. Y.
Foerste, August F., Dayton, Ohio
82 Brachiopods, Kentucky, Indiana and Ohio
Fornonzini, Gervaso, Valtellina, Lanzada, Italy
2 Minerals, Valmalenco Valley, Italy
Frierson, L. S., Gayle, La.
Texas salamander, Louisiana
Gates, Elias, Coxsackie, N. Y.
Grooved ax, Keokuk, Iowa
Gilman, E., Cornwall, N. Y.
European hornet work, Cornwall, N. Y.
Giovanoli, Leonard, Lexington, Ky.
Mudpuppy, Kentucky
Gregory, H. B., Arden, N. Y.
Live wildcat, Arden, N. Y.
Hall, W. J., Troy. N. Y.
35 Archeological specimens, Watertown, N. Y.
Hancock, Richard, Birmingham, Eng.
Aquatic spiders, Birmingham, Eng.
Hecht, Helen, Saratoga Lake, N. Y.
2 Fish, Saratoga Lake, N. Y.
Hippisley, Mrs W. W., Terrace, B. C.
Spiraea galls, Terrace, B. C.
Hofmayr, John, Buffalo, N. Y.
2 Amphibians, Allegany State Park, N. Y.
Holligan, Edward, Albany, N. Y.
Star-nosed mole, Albany, N. Y.
Hopkins, A. S., Long Island, N. Y.
Spider, Babylon, Long Island, N. Y.
Horsey, R. E., Rochester, N. Y.
Larch case bearers
Wood-boring grubs
Rhododendron borer work
House, H. D., Albany, N. Y.
Painted turtle, Albany, N. Y.
Huested, P. L., Blauvelt, N. Y.
Box midge galls and larvae, Blauvelt, N. Y.
Ives, J. D., Jefferson City, Tenn.
3 Amphibians, Tennessee
Jacobs, J. V., Round Lake, N. Y.
Spring canker worms, Round Lake, N. Y.
Johnson, F., Albany, N. Y.
Hog-nosed snake, Albany, N. Y.
Klauber, L. M., San Diego, Calif.
California newt, California
Knobel, L., Hope, Ark.
Spiders, Hope, Ark.
Larchmont Greenhouses, Mamaroneck, N. Y.
Specimens of greenhouse leaf tyer, Mamaroneck, N. Y.
Mackey, R. W., Millerton, N. Y.
Rattlesnake, Millerton, N. Y.

MacClelland, Kenneth, Pawling, N. Y.
Skull of wildcat, Pawling, N. Y.
Martin, Mrs Carmelita, Worthington, Mass. (through William F. Jacob, Schenectady, N. Y.)
Framed picture of Joseph Henry's birthplace at Albany, N. Y.
Mastiske, Conrad, Albany, N. Y.
Musk turtle, Kinderhook Lake, N. Y.
Miller, E. S., Wading River, N. Y.
Golden tortoise beetle, Wading River, N. Y.
Moore, Emmeline, Albany, N. Y.
Pirate perch, Babylon lake, Long Island, N. Y.
Myers, Charles, Watervliet, N. Y.
Muskrat, Schuyler brook, N. Y.
Newland, D. H., Menands, N. Y.
Zircon, Indiahoma, Okla.
Paladin, Arthur, Albany, N. Y.
Gray fox skull, Karners, N. Y.
Raccoon skull, Stuyvesant, N. Y.
Palmer, Walter L., Albany, N. Y.
Specimen of meerschaum
Parkes, W. A., Toronto, Canada
Serpulites, Craigleth, Ontario, Can.
Patio, R., Malone, N. Y.
White-footed mouse, Malone, N. Y.
Patterson, J. H., Albany, N. Y.
Moss agate, Sidney, Mont.
Peirson, H. B., Augusta, Me.
Balsam galls, Augusta, Me.
Peltz, John DeWitt (Estate), Albany, N. Y.
66 Ethnological and archeological articles, Colorado, New Mexico (Received for disposition and donated to the Santa Fé Museum, New Mexico)
Perkins, Anne E., Collins, N. Y.
160 Plants, Erie county, N. Y.
Phelps, Mrs Orra Parker, Saratoga, N. Y.
250 Plants, St Lawrence, Saratoga and Warren counties, N. Y.
Hog-nosed snake, Saratoga, N. Y.
2 Mammals, Wilton, N. Y.
2 Mammals, Saratoga, N. Y.
Pollard, Ray T., Cobleskill, N. Y.
Striped corn borer larvae, Cobleskill, N. Y.
Potter, Catherine E. B., Whitehall, N. Y.
Collection of Spanish War and battleship "Maine" relics, made by Rear Admiral Potter; five Zulu spears, Africa
Reid, Alan, Troy, N. Y.
Garnet crystals, Horicon, N. Y.
Richardson, C. H., Syracuse, N. Y.
Ordovician limestone slab, Cavendish, N. Y.
Rogers, John, Albany, N. Y.
Cephalopod, New Salem, N. Y.
Ruedemann, Paul, Tulsa, Oklahoma
Graptolites, Ouatchita mountains, Oklahoma
Schaeffer, Charles, Brooklyn, N. Y.
West Indian peach scale, Brooklyn, N. Y.
Schillinger, Roy, New Lebanon, N. Y.
Milk snake, Lebanon Springs, N. Y.
Schoene, W. J., Blacksburg, Va.
European hornet work, Blacksburg, Va.
Schoonmaker, Mrs W., Rensselaer, N. Y.
House mouse, Rensselaer, N. Y.
Seaver, Fred J., Bronx Park, N. Y.
Japanese beetles, Bronx Park, N. Y.

Smith, Burnett, Syracuse, N. Y.
Fossil bear skull, Syracuse, N. Y.
Tooth of Casteroider, Syracuse, N. Y.
Smith, Ellsworth, Larchmont, N. Y.
West Indian peach scale, Larchmont, N. Y.
Spingern, J. E., Amenia, N. Y.
Larvae and work of willow leaf beetle, Amenia, N. Y.
Stein, W., Albany, N. Y.
Millipede, Selkirk, N. Y.
Stene, A. E., Kingston, R. I.
Juniper webworm work, Kingston, R. I.
Stevens, R., Greenwich, N. Y.
Wheat wireworm larvae, Greenwich, N. Y.
Stoneman, B., Albany, N. Y.
3 Archeological specimens, Texas
Stoneman, John E., Albany, N. Y.
Copper, Jerome, Ariz.
Gold, Stanton, Ariz.
Sweet, R., Troy, N. Y.
Ring-necked snake, Eagle Mills, N. Y.
Thacher, Mrs John Boyd (Estate), Albany, N. Y.
4 Iroquois wampum belts
Hiawatha Belt
Washington Treaty Belt
Commemorating First Sight of Pale Faces
Commemorating Champlain's Visit in 1609
Tiffany, R. W., Cambridge, N. Y.
Pyrite nodules, Cambridge, N. Y.
Tiffany, William J., Kings Park, N. Y.
Willow galls, Kings Park, N. Y.
Townsend, Frederick, Loudonville, N. Y.
Hog-nosed snake, Loudonville, N. Y.
Garter snake, Nassau, N. Y.
Tucker, Gilbert M., Albany, N. Y.
10 fragments of petrified trees, Holbrook, Ariz.
Audubon drawing of Crow, framed
Viereck, H. L., Washington, D. C.
Starling, Albany, N. Y.
Wagner, Clarence, Buffalo, N. Y.
3 Amphibians, Allegany State Park, N. Y.
Wagner, Ruth, Buffalo, N. Y.
Dusky salamander, Allegany State Park, N. Y.
Welcging, Richard, Schenectady, N. Y.
Fossil seaweed, Schenectady, N. Y.
Were, Arthur, Edna and Elizabeth, Albany, N. Y.
2 Ribbon snakes, Altamont, N. Y.
Spiders, Voorheesville and New Salem, N. Y.
Whiteford, M. W., Keeseville, N. Y.
Boulder and brachiopods, Keeseville, N. Y.
Williams, Homer B., Granville, N. Y.
2 Slabs Lower Cambrian slate, Granville, N. Y.
Woman's Roosevelt Memorial Association, New York City (Through Regent Charles B. Alexander, New York City)
Theodore Roosevelt medal
Young, Ruth, Slingerlands, N. Y.
Star-nosed mole, Slingerlands, N. Y.

By Exchange

Belanski, C., Nora Springs, Iowa
240 Devonian fossils, Iowa
Cornell University, Ithaca, N. Y.
9 Mammals, McLean, N. Y.

10 Mammals, Ithaca, N. Y.
2 Mammals, Cayuta Gorge, N. Y.
Gray squirrel, Danby, N. Y.
Florin, Rudolph, Stockholm, Sweden
6 Devonian fossil plants, Bear Island, Sweden
2 Devonian fossil plants, Norway, Sweden
Gortani, M., Bologna, Italy
53 Silurian graptolites, Sardinia, Italy
McKelvey, Robert, Saratoga, N. Y.
Quartz, Griqualand West, South Africa
Manck, E., Plauen, Saxony, Germany
12 Silurian graptolites, Saxony, Germany
National Museum, Washington, D. C.
62 Devonian fossils, West Virginia, Pennsylvania, Maryland
Train, Percy, Rochester, N. Y.
12 Triassic fossils, American Canon, Nevada
Troedsson, Gustaf, Stockholm, Sweden
19 Graptolites, Sweden

By Purchase

Fletcher, Lewis D., Newburgh, N. Y.
Eskimo curlew
2 Passenger pigeons
Reinhard, E., Buffalo, N. Y.
12 Fossils, Ohio and New York
6 Fossils, Buffalo, N. Y.
Roof, Mrs Arthur B., Cannonsville, N. Y.
Cast of rill channels, Cannonsville, N. Y.

By Museum Staff

Adams, Charles C., Albany, N. Y.
Celt, Howland Island, N. Y.
Alexander, W. P., and House, H. D.
1170 Plants, Allegany State Park, N. Y.
Bishop, S. C., Albany, N. Y.
Black snake and eggs, Albany, N. Y.
Pickerel frog, Albany, N. Y.
18 Reptiles, amphibians and eggs, Allegany State Park, N. Y.
Garter snake, Tennessee
Rattlesnake, Honeoye Lake, N. Y.
Hellbender, Allegheny River, N. Y.
Collection of amphibians and reptiles, Tennessee and North Carolina
Fence swift, Tennessee
Five-lined skunk, North Carolina
2 Fish, Allegany State Park, N. Y.
2 Mammals, Allegany State Park, N. Y.
Collection of spiders, New York, Tennessee, Georgia, North Carolina
Brown, C. A., Albany, N. Y.
230 Plants, Albany, Rensselaer, Greene counties, N. Y.
Chadwick, G. H.
Crustaceans and worms, Catskill, N. Y.
Chamberlin, K. F.
950 specimens of insects, largely from the vicinity of Albany
Clarke, N. T.
2 Snapping turtles and eggs, Lake George, N. Y.
Felt, E. P., Albany, N. Y.
3050 specimens of insects, largely from the vicinity of Albany
Goldring, Winifred, Albany, N. Y.
13 Upper Devonian plants, Gilboa, N. Y.
Ring-necked snake, Slingerlands, N. Y.
Planarian, Slingerlands, N. Y.

Harper, Francis
Collection of mammals, Essex county, N. Y.
Collection of mammals, Indian Lake, N. Y.
Hartnagel, C. A., Albany, N. Y.
Canajoharie shale slab and graptolites, Fort Ticonderoga, N. Y.
Hotchkiss, Neil, Albany, N. Y.
75 Plants, Albany, Rensselaer, Onondaga, Delaware counties, N. Y.
200 Plants, Lewis county, N. Y.
House, H. D., Albany, N. Y.
1373 Plants, 13 New York counties
Kilfoyle, C., Albany, N. Y.
28 Graptolites, Tea Falls, N. Y.
23 Fossils, Rensselaer, N. Y.
4 Graptolites, Crescent, N. Y.
Ruedemann, Rudolf, Albany, N. Y.
72 Graptolites, Stringtown, Okla.
4 Fossils, Limestone Gap, Okla.
Schoonmaker, W. J., Albany, N. Y.
Mountain salamander, Catskill, N. Y.
3 Amphibians, Albany, N. Y.
2 Amphibians, Stamford, N. Y.
Eggs of tiger salamander, Syosset, N. Y.
Mudpuppy, Quaker Run, N. Y.
Hellbender, Allegheny river, N. Y.
Slimy salamander, Allegany State Park, N. Y.
Red-backed salamander, Malden Bridge, N. Y.
Sheep's head, Lake Champlain, N. Y.
2 Fish, Allegany State Park, N. Y.
6 Mammals, Allegany State Park, N. Y.
6 Mammals, Essex county, N. Y.
Cotton tail, Burden lake, N. Y.
Collection of woodchucks, Rensselaer county, N. Y.
Shaw, William T., Albany, N. Y.
Collection of mammals, Rensselaer county, N. Y.

By Transfer

Conservation Commission, Albany, N. Y.
Blue-spotted sunfish, Greenwood lake, N. Y.
Pickerel, Hudson run, N. Y.

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Photo by Schneckenburger, courtesy of Buffalo Society of Natural Sciences

Figure 2 Field laboratory used by the research staff of State Museum working at the Allegany School of Natural History in the Allegany State Park

Photo by Schneckenburger, courtesy of Buffalo Society of Natural Sciences

Figure 3 Research and educational staff of the Allegany School of Natural History in the Allegany State Park

Photo by Schneckenburger, courtesy of Buffalo Society of Natural Sciences

Figure 4 Type of cabin furnished the research staff working on surveys in the Allegany State Park region

Photo by Stein

Figure 5 A part of the historical collection of household and industrial materials, secured for the State Museum from the original American Shaker settlement near Albany, N. Y.

THE IMPORTANCE OF PRESERVING WILDERNESS CONDITIONS

By Charles C. Adams Ph.D., D.Sc.

Director, New York State Museum, Albany, N. Y.

INTRODUCTION

The subject of the preservation of areas in a natural or wilderness condition has been discussed more during the past ten years than during all of our previous history. The reason is that with our increased population we are becoming definitely conscious of the limitations of our natural resources. As long as these resources were considered boundless and inexhaustible we drifted along with the unconcern of children at play. Now we are beginning to realize that this problem is a phase of the fundamental relation of the people to the national resources of the country, or a phase of the "land problem." With the exception of the very arid regions, most wild land is in forests and therefore special attention is given to the foresters' point of view. Foresters began the study of their problem as an economic one, as a part of the general conservation movement, and are now just beginning to see that grazing and wild life are also a part of their problem, and are becoming conscious of the social aspects of the whole conservation movement. This realization has recently been brought about through an appreciation of the recreational and educational phases of the movement; which are distinctly social rather than economic. The earlier development of forestry so strongly imbued the profession as a group with economic standards and ideals that many are wholly unprepared for the next advance, which is almost certain to be strongly social. Later we may expect to see these two phases properly balanced both in theory and in practice, but many preliminary adjustments are yet to be made before the broader aspects of the problem are likely to be adequately appreciated. Certain conservatives are now preaching the dire results of the recreational wave, and of the menace threatening "economic" forestry from a too extensive development of parks. Future leaders should take a broader and possibly a "higher view" of the whole problem.

This dominance by economic standards of forestry has tended to make the forester desire to cut over, graze or change in some way nearly everything under his control, except where he dared not, as

in the case of protection forests. The value of virgin wilderness conditions for the study of forest ecology has not in the past received better recognition partly because forest research has been pushed aside by administrative emphasis. W. W. Ashe was a pioneer among foresters in advocating the preservation of natural conditions in forests for scientific and silvicultural purposes, and later Barrington Moore, through his interest in forest ecology, became a champion of the cause. Then Aldo Leopold enthusiastically urged the preservation of the wilderness from the standpoint of recreation and wild life. Great momentum is developing among other groups of leaders, not foresters, with whom a reckoning must be made if public interests are given a fair hearing. So much for the general background.

WHAT IS A WILDERNESS CONDITION?

In the old days the idea of a condition of nature was not very carefully analyzed or understood. It was supposed to be a "balanced condition," and we were not very clear just what that meant. This often implied that independent of man's influence, nature was always "balanced," although modern ecology has taught us that in natural conditions, as in all others, this is a relative condition and not a fixed or absolute state; one that is a part of a cycle, involving a continuous process of change in response to all sorts of pressures and influences. The relative balancing of these various influences gives us the so-called balanced condition or a "dynamic equilibrium," which includes a summation of the larger and smaller units of dominance, which with every disturbance are followed by other changes.

Thus when ecologists emphasize the need of setting aside reservations for the preservation of natural conditions they do not mean, and certainly do not expect, the conditions to remain indefinitely "balanced," fixed and unchanged or unchanging, because they know that it is utterly impossible, both theoretically and practically, so to isolate a reservation from the rest of the world and keep it free from all outside influences.

Reservations set aside, however, *to allow nature to take her own course, with as little interference by man as is possible,* is quite another matter and is fundamentally all that is desired. To accomplish this is a very difficult undertaking.

THE VARYING DEGREES OF THE WILDERNESS

As the degree of natural conditions is truly measured by its inverse relation to man's interference, we readily see why there are all degrees from natural conditions to the other extreme, such as metropolitan conditions where nature is crowded to the wall. On the one hand we have the different degrees of the destruction of natural conditions, and on the other hand, we have a whole series of conditions built up deliberately by man, all stages and degrees toward a *restored condition,* closely simulating natural conditions. We have known for ages that when man abandons the land it will "go back to nature" in a comparatively short time, depending of course on the character of man's interference, but this restoration is not the same thing as virgin or natural conditions. If this were true our problem would be much simpler than it is.

Urban conditions generally result in very great changes of natural conditions and the industrialized, residential and park uses of the land show many degrees of difference in the intensity of interference. The same is true of agricultural lands. The degrees from orchard and vineyard, grain fields, pastures to woodlots and mature forests likewise show many degrees. In the case of large forests, forested parks, game preserves and such uses of the land, we see relatively less disturbance with the natural conditions than in the more intensively cultivated areas. The cutting of a forest and the different systems of management will without question influence the ecological conditions for both plants and animals, but many of these changes are not so drastic, if fires are excluded, as to prevent the preservation of many plants and animals as long as the major habitats are preserved, as in the case where a continuous forest cover is maintained. In relative terms a woodlot is a wild area on a farm, and in the large state and federal forests there are remote areas which are today in a nearly or completely natural condition. Some of our national parks and some national monuments are in a relatively natural condition, but during the past few years the furore of advertising them and the efforts to get millions of persons into them—before an adequate staff and appropriations are available to handle the crowds—as well as certain policies, such as the introduction of exotic plants and animals and grazing, have caused very serious injury to many of these parks. As the public is taught the significance of these facts we hope that conditions will be remedied, because our national parks have given to the world a

new and valuable idea and ideal of land use. This conception is also having a beneficial influence upon forest policies, which have been too exclusively economic and very slightly social in their aims.

In the national and state forests we have a major opportunity for the preservation of excellent samples of natural conditions, since there are large areas that must be devoted to protection forests, and there are other large areas that will remain relatively natural for an indefinite period. Because of their remoteness some of these lands will long remain natural reservations in spite of economic policies.

In the national forests lumbering, grazing and particularly the extensive overgrazing have a blighting influence upon the natural conditions of the vegetation, and with poison weed control, reseeding, planting and similar methods the perpetuation of natural conditions becomes very serious indeed. Grazing animals compete directly with the large game animals in many places, not merely for forage and browse but also for water.

THE VALUE OF THE WILDERNESS

The value of the wilderness must be judged ultimately by its contributions to social welfare. We have no better criterion. What therefore are some of the benefits? First of all let us turn to our own history for a few suggestions. Our American public first learned of natural conditions during its pioneer history. Historians have shown us how much our American democratic institutions have been a direct outgrowth of our *pioneering,* and how this has tended to encourage independence, self-reliance and other traits which have contributed so much toward our institutions and our ideals. There is a whole literature built upon this phase of our national life. Without question this background and our public domain, out of which we could with relative ease set aside national parks and national forests, have been dominating influences in acquainting Americans with the charm of the wilderness. Our first and greatest champion of all this was John Muir, who exemplified the benefits derived from the appreciation of the wilderness. He was a naturalist, an artist, and from the wilderness he derived science, art, education, recreation, producing a literature which is a wonderful blend of all these. He thus exemplified the social uses of the wilderness at its best. This great contribution could not come from one dominated by economic ideals. A whole Nation is now becoming educated to the Muir ideal and, as has been said, this is one of America's large and original contributions to the use of the land, as a definite land policy. This is

a policy which has since spread to the Old World and seems destined to have a great future there.

We may briefly summarize the value of natural conditions under the following heads: artistic, scientific, educational, recreational and economic, bearing in mind, of course, that these groups grade imperceptibly into one another in various directions.

Artistic. The inspiration and ideals which the painter, the poet, the author and the artistic photographer get from the wilderness is a form of leadership which helps the average person, not so keenly gifted to see and appreciate the beauties and wonders of wild nature (Figures 6 and 7). Muir, Thomas Moran and J. C. Van Dyke have opened up a whole world of interest and beauty to thousands of travelers and stay-at-homes. Jens Jensen, the landscape architect, has long preached the need of preserving wilderness conditions for the inspiration of such leaders. A nation can afford to pay a high price for such leaders but they can thrive only in a favorable environment. Sanborn (The Personality of Thoreau, 1901, p. 5) has said, "When Emerson said to his young visitor that 'he was always looking out for new poets and orators, and was sure the new generation of young men would contain some,' Thoreau quaintly said that 'he had found one in the Concord woods—only it had feathers, and had never been to Harvard College; still it had a voice and an aerial inclination—and little more was needed.' 'Let us cage it,' said Emerson. 'That is the way the world always spoils its poets,' was Thoreau's characteristic reply."

Scientific. Too often science is looked upon solely as a tool for economic purposes and many overlook the esthetic and intellectual pleasure derived from its study. There is as keen pleasure of understanding a problem as there is in looking at a beautiful scene or picture. Science is also a recreation for many persons, and one that merits much greater attention than is customary these days. The practical advantage of science might seem to need little emphasis to foresters, since forestry depends so much upon biologic, economic and social science, and yet I am convinced that the lack of scientific research is today one of the major limiting factors in the advance of forestry, particularly on the side of forest ecology, including economic and social research. In forest ecology research conducted on wilderness conditions is needed to supplement controlled experimental studies. We need to study not only forests but as well the animals if we are to have a thorough grasp of the forest as a functional biotic community.

Educational. The educational value of wilderness areas, aside from its scientific value, is very comprehensive and far-reaching. This applies to the young and to adults, and covers esthetic, scientific, recreational, economic and social aspects. With the industrialization and urbanization of our people it becomes increasingly urgent that the problems of the rural world be presented to them in concrete form. Otherwise they will certainly lose contact and sympathy with such conditions. I anticipate that this will be one of the major problems of the forester during the next generation. Economists and sociologists are already warning us of the danger of over-industrialization, and of its menace to agriculture and forestry, because the rural and the urban problems should be properly balanced for the welfare of the people as a whole. The general public should be taught that wilderness areas are of such great educational value that they must be preserved, even if public use is rather severely restricted in the immediate utilization of such areas.

Recreational. First of all let us note that recreation is not necessarily synonymous with the Coney Island variety of amusement. Recreation as a psychological and physiological change has come to have a new meaning with the industrialization of our people. Monotonous and mechanical routine makes recreation not a luxury but a necessity to a vast number of people. We have come to look upon play not as a waste of time, but as a normal healthy function, and even in education it is a relatively new idea to grant that the play of children is to be encouraged and not simply to be tolerated.

A complete change from our customary routine is one of the most important elements in recreation. It is for this reason that wild areas have a particular charm for the city dweller, and the more complete the change the better, if one is trained to appreciate the difference and to take advantage of it. A virgin forest of huge trees has an appeal not found in cut-over lands. Of course, there are many who do not know the difference, but there are those who clearly do.

Economic. And lastly the economic value of the wilderness should not be overlooked. Not long ago there were objections to "locking up" the natural resources in the national parks: the forage, the water, the timber, the game etc., and envious eyes looked upon all these as really wasted. We have not yet outgrown all this, yet some of the neighbors of the national parks are now beginning to learn that these so-called locked-up resources bring more money into their region than their own wide open system. The wilderness has thus come to have an economic value, but if we had allowed the

economic interests to control (and they have too much influence even today), they would have ruined our national parks before we had learned to appreciate their value. This statement can not be repeated too often. We may safely predict that the value of these areas will increase in direct proportion to our being able to keep them steadily wild and virgin. These must be preserved even at the cost of a very severe struggle. The public should be taught that overcrowding, alienating and tampering with these wilderness areas will ruin them, and that this will ultimately destroy their economic value in most instances. The state parks and state forests must also face this same problem.

METHODS OF PRESERVING NATURAL CONDITIONS

The best methods of preserving natural wilderness conditions are very difficult to accomplish and the importance of this subject is so great that every possible method should be utilized. At present the outstanding and most successful method has been to encourage the *ideal* which has been slowly developing for our national parks. To live up to that ideal—*to pass on to future generations natural conditions unimpaired*—is a very difficult undertaking. It can not be assured until an eager, intelligent public sentiment is developed to support trained public officials. We can not maintain this standard in overcrowded parks, with inadequately trained staffs, with the importation of exotic plants and animals, fish and game, and with inexpert control of predatory animals, the pollution of streams, grazing and the cutting of timber, or light burning, the excess of roads or even trails. Such measures can be stopped only when an informed public insist upon the maintenance of the ideal which has now been evolving for over 50 years. National monuments need a kind of care similar to that of the national parks.

It is very interesting to note that the Swiss have gone much beyond us in their methods of preservation of their smaller national parks. Thus Dr Carl Schröter has recently said:

Shooting, fishing, manuring, grazing and woodcutting are entirely prohibited. No flower nor twig may be gathered, no animal killed and no stone removed; even the fallen tree must remain untouched. Nature alone is dominant! No hotels are allowed to be erected, and, naturally, no routes for motor cars. The whole must conserve an alpine character. Camping and the lighting of fires is prohibited. How different are the American national parks! There, big hotels are erected, automobile routes are constructed, and camping, even fishing is allowed. The American national parks are pleasure resorts, our national park, a 'Nature Sanctuary!' (Jour. of Mammalogy, 8:350–51, 1927.)

Turning now to the national forests, we find there are vast areas of wilderness in them, probably exceeding in area that of all our national parks, which are approximately as virgin as the parks themselves. But the national forest ideal involves changing these virgin conditions as rapidly as cultural methods can reach their remote or inaccessible areas. The protection forests are not likely to be distributed greatly. In addition to the virgin areas, which should be preserved for the study of forest ecology in the broadest sense, there should be set aside, as advocated by Emerson Hough and Aldo Leopold, certain large areas as true wilderness. Hough, advocated the Kaibab Plateau, north of the Grand Canyon in Arizona, and Leopold favored the Gila region in New Mexico and a similar effort has been for the preservation of a tract in the Superior Forest in Minnesota. Certainly we have other suitable areas, of variable size, in Utah, Idaho, Colorado, Oregon and Washington, in addition to Alaska, and possibly in Canada, that merit similar attention. To accomplish these results, however, there will need to be considerable change in the attitude of many officials and foresters. The acreage usually suggested for such reservations has often been very small indeed, due in part no doubt to the fear of not getting a hearing at all if large areas were suggested, and possibly also to the influence of the example of small "sample plots," used in silviculture. These areas should be large enough to preserve fair samples of all the more important types of forest communities under varied conditions, and more attention should be paid in their selection to the welfare of the plants and animals than to administrative *convenience*. Smaller areas also have their value if properly selected.

In the state forests and parks there should be definite provision for the preservation of certain areas in a natural state (Figures 8 and 9). In the highly modified conditions of the East this is more difficult, although along the coasts and in swampy, sandy or rocky areas there are yet to be found many valuable sites. In the West, however, the problem is often simpler, except in the very fertile agricultural areas, where progress seems to be relatively the slowest.

Some persons are enthusiastic over the policy of the preserving of such reservations by private individuals, but few of such preserves survive more than two or three generations, and generally the second is the turning point.

While there has been considerable activity for the establishment of game preserves and bird reservations, the primary purpose subordinates natural conditions to certain game or to birds, and control measures destroy the natural conditions in varying degrees. Such organizations are not today a very hopeful source of aid for the preservation of natural conditions, because as a rule the special interest is so strong that they consider their interference negligible or desirable.

One of the most hopeful prospects for the preservation of natural conditions is in connection with various educational institutions and organizations, including museums. Several of our state universities have already acquired lands and water which they use for scientific purposes, and some such areas are being preserved in a wild state. Thus the University of Washington has a marine biological station and has made a preserve area as a part of it. The University of Montana has some lands on Flathead lake which have this possibility. The University of Illinois has a small reservation. Indiana University has a small tract. Cornell University has a wild flower preserve as well as the McLean Bog for this purpose. The New York State Museum, under the leadership of Dr John M. Clarke, acquired by gifts several valuable geological reservations, but funds were never available to protect the plants and animals on them. Yale University has recently acquired 200 acres for a preserve. It is not virgin but plans are being made to restore it. The University of North Carolina has a 950-acre wooded tract adjacent to the campus. Some of the western state universities own considerable land, and ought to be able to set aside valuable areas as wild preserves if a serious effort is made to do so, particularly in Minnesota with its state land.

In spite of the preceding remarks, the universities have been particularly backward in acquiring wild lands for both teaching and for research. Without such lands they are likely to lose touch with outdoor natural history, ecology and allied problems of conservation. It is largely in an indoor atmosphere that what Dr W. M. Wheeler of Harvard University called "academic dry rot" thrives, and biology can not afford to lose contact with the natural conditions of life. The same condition holds for museums. Only the largest metropolitan museums can hope to be world microcosms, and even these grow largely by their active field work and explorations. Smaller museums need to maintain a similar contact with the outer world

and direct active interest in carefully selected reservations and field survey in order to retard the growth of "dry rot" which at times infests other educational institutions. The advantage therefore of wild areas is not simply the opportunity for an occasional visitor and student to make some special study—as important as that is—but is the influence upon the workers themselves and their institutions. If our educational institutions do not have this advantage educational leadership in such matters will pass on to other better qualified leaders.

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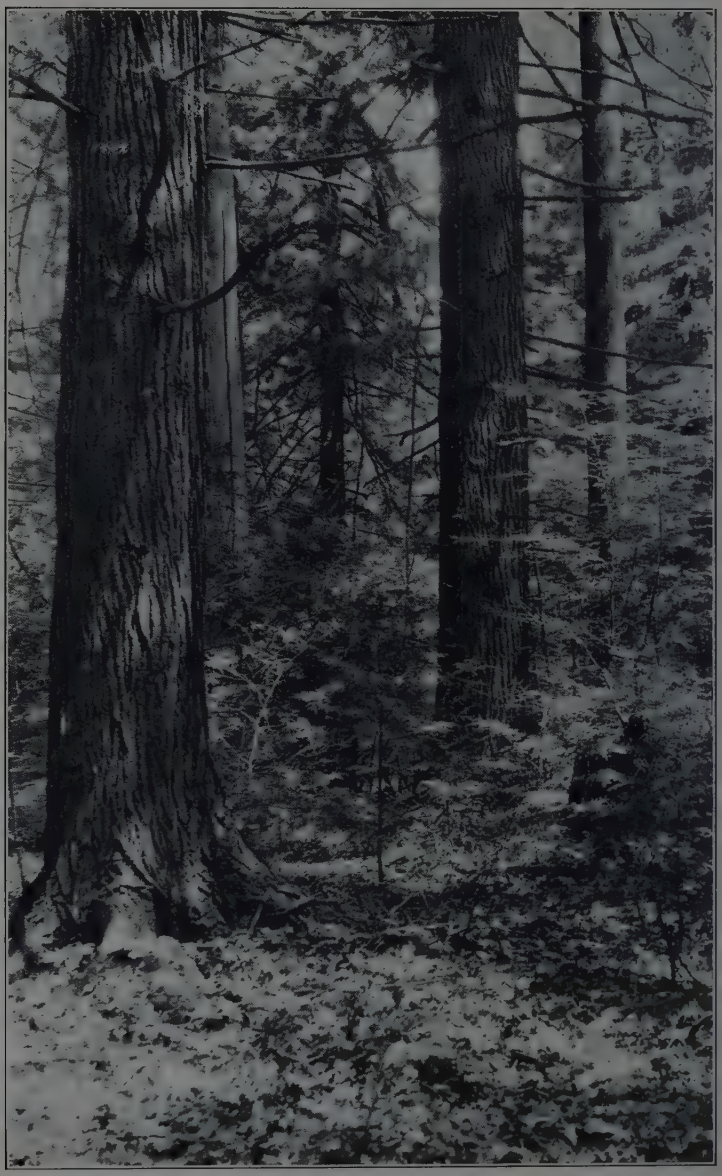
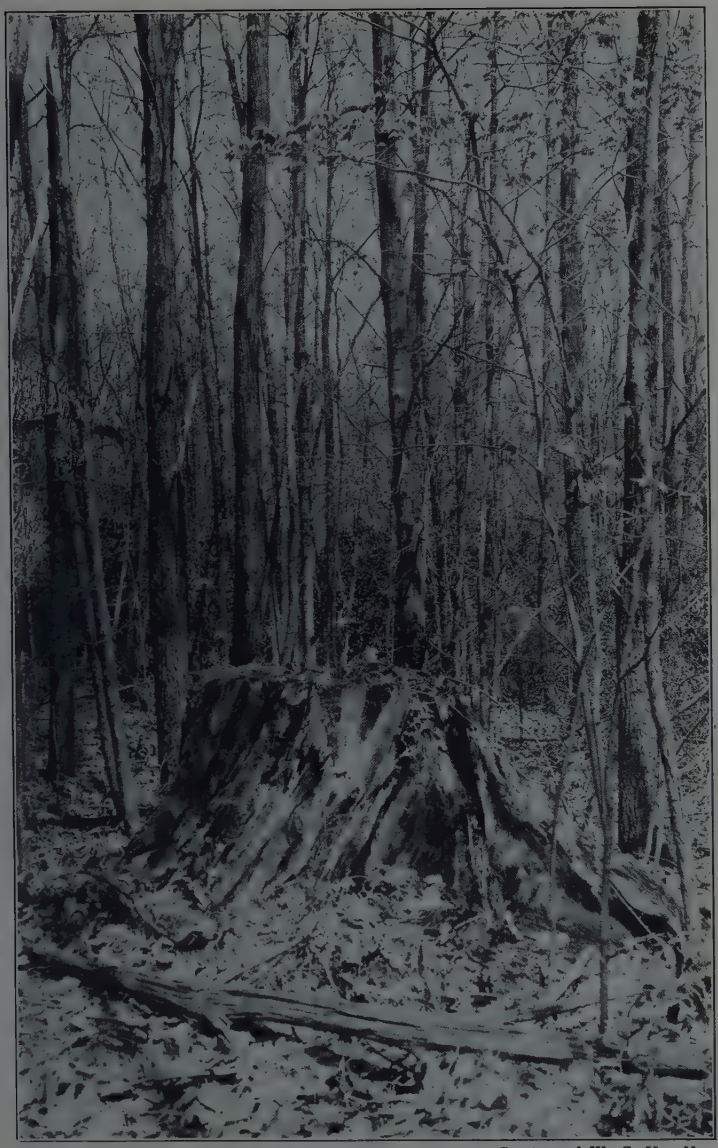


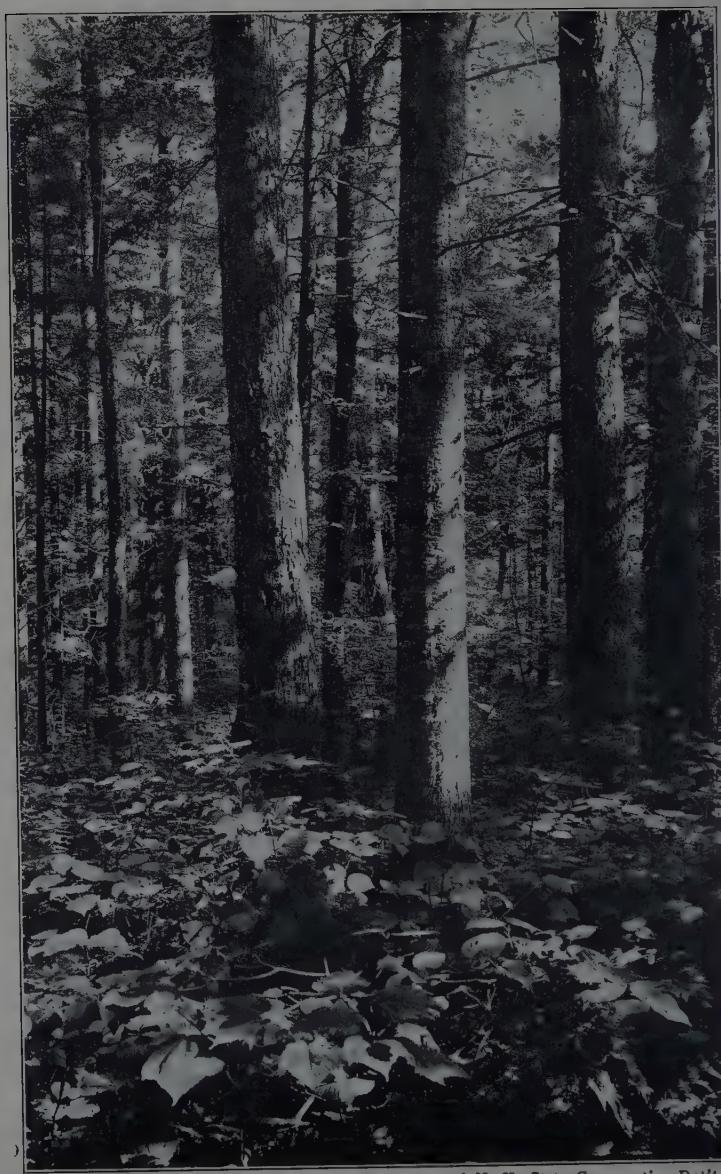
Courtesy of W. G. Van Name

Figure 6 Must we urge the preservation of such samples of virgin forests? There are other values as well as economic. The Cook Forest in western Pennsylvania.



Courtesy of W. G. Van Name

Figure 7. Or do we prefer this sort of forest; even a generation after cutting? Part of the Cook Forest in western Pennsylvania.



Courtesy of N. Y. State Conservation Dep't

Figure 8 Does New York State need to preserve *samples* of such forests? Virgin hardwoods on Seward mountain in the Adirondacks.

Courtesy of New York State Conservation Dep't

Figure 9 Another view in the Adirondacks. How long will it require to restore this?

MAKING FOSSILS POPULAR IN THE STATE MUSEUM

By Rudolf Ruedemann and Winifred Goldring

Paleontologists, New York State Museum, Albany, New York

Popularizing fossils sounds simple enough until the work is actually undertaken. When the present State Museum was ready for the installation of exhibits the Hall of Invertebrate Paleontology was turned over to Doctor Ruedemann, now State Paleontologist. Very little had been done in the old Geological Hall (the former headquarters of the Museum) in the way of exhibiting fossils, so that Doctor Ruedemann had upon his hands the installation of an entirely new invertebrate exhibit. The various types of cases had been carefully chosen even before the Museum was ready. One type of case was used for the whole synoptic collection, and here maps showing the extent of the sea during the different periods, and also charts, each showing the outcrops of one formation with its different facies, were used to make the exhibits more intelligible. Exhibits of special groups, such as trilobites, eurypterids, crinoids etc., were displayed in another type of case. Wall cases were used to supplement the synoptic exhibit and also for special exhibits. Gradually still other types of cases were introduced as they were found necessary for particular displays. The aim throughout was to avoid monotony caused by too much sameness in the cases and to strive for the most interesting forms of display. Small and more technical labels were numerous, of course, but these were supplemented by larger explanatory labels of a more general nature. We tried to make an attractive and interesting exhibit of fossil material, and from comments made by scientists and others felt that we had succeeded rather well.

As time went on, however, from watching the persons who visited the Museum, we began to feel that we had perhaps catered too much to the scientists and those already with some training in or understanding of fossils. It was not very flattering to have a group of persons enter the Hall of Invertebrate Paleontology, give a quick look around, and say, "Let's go out; there is nothing but dead things in here." It was quite evident that we needed to increase our efforts to make our exhibits intelligible and interesting to the general public. Our fossils must be made to live. With this in mind restoration groups and explanatory cases are gradually being introduced among the fossil exhibits.

Of the latter kind are the two cases explaining "What is a Fossil?" planned by Miss Goldring to give the unscientific visitor a background which will permit him to study the fossil exhibits with more understanding. These cases stand near the entrance of the hall. A label with a full but simplified definition of a fossil is placed at the top of one case. This case shows examples of all the different ways in which a fossil may be preserved. Likewise in this case is a series of specimens showing various stages in fossilization from loose shells on a sea beach or river bank through loosely consolidated specimens to completely cemented fossil-bearing rocks. Examples of the effect of partial and complete weathering on fossil-bearing rocks are also shown. Clay concretions, often mistaken for fossils because of their odd shapes, likewise have their place here, as well as pseudo-fossils which are of inorganic nature — either stains from decaying vegetable matter or branching mineral incrustations often mistaken by the uninitiated for fossil mosses or ferns.

The second case has various illustrations of the preservation of organisms according to their original composition. Here are shown the effect of conditions of preservation upon the original form, also fragmentary preservation and the distortion of fossils by movements of the rock beds in which they are preserved. In this case belongs also the explanation of types, models, restorations, "squeezes" of various kinds, thin sections, natural and polished sections which are so often seen in fossil exhibit cases and not always comprehended.

It has been said that a museum should be a collection of labels illustrated by specimens; and that idea has been carried out in these cases. Very full explanatory labels accompany all the examples; but for those who wish to spend less time there are subheadings with the specimens, which with the full title label permit them to gain something from these cases with a quick survey.

The results obtained from these two cases have been very gratifying. They have attracted wide attention not only from the general public but also from scientific visitors. Because of the success of these cases, a similar exhibit has been installed in the new Peabody Museum at Yale University. Dr F. A. Bather of the British Museum was much impressed with the cases when he visited our Museum a couple of years ago and has since then written a short paper in which he points out the need for such a case in every museum.

Another educational case, "What is a Geological Formation?" has recently been installed by Miss Goldring as a companion to the "What is a Fossil?" exhibit. It has been placed near the entrance

to the Hall of Invertebrate Paleontology at the beginning of the series of synoptic cases, and has already attracted considerable attention.

The case was designed to give a better understanding of the meaning of a geologic formation. On top of the case is a title label giving a comprehensive and understandable definition of a geological formation, and in the case is a large, very full explanatory label. Six geologic maps of the State are shown. One map gives the surface distribution of the rocks of all the different ages. Each of the other five maps shows one of the important divisions: the present outcrop of the rocks of that age; the former extent of the rocks, which erosion has decreased; and the extension of these rocks southward under the younger beds. Five cross sections made through different parts of the State show the undersurface conditions: the relations of the beds of the different ages, their general slope and thickness. A geologic column is used to show in more detail the succession from the oldest to the youngest beds in the eastern and western areas.

A plate of drawings of a few characteristic fossils has been made for each age. The visitor is referred to the synoptic cases where are displayed the actual fossil specimens of these and other species, and also outcrop maps of the various formations and maps showing the configuration of North America at each stage.

Colored photographs of typical exposures of the rocks of the different formations add to the attractiveness and instructive value of this case. These photographs are colored in oil so that there is no danger of fading. The Museum draftsman, E. J. Stein, has made a specialty of this oil coloring.

Some restorations in plaster were used from the first in the Museum. More were introduced when we began to see how important they were in giving a better understanding of our fossils; and then came our wax restoration groups which have attracted such wide attention. With the exception of the Devonian Forest restoration, all the restorations and restoration groups were to a greater or less extent planned by Doctor Ruedemann and he supervised the work of the artist and sculptor, Henri Marchand. The plaster restorations include life-sized models of eurypterids (*Eusarcus, Stylonurus* and *Pterygotus*), life-sized models of *Crustaceans* (*Mesothyra, Lichas, Homalonotus* and *Dalmanites*), models of growth stages of four species of eurypterids (*Hughmilleria shawangunk* Clarke, *Eurypterus maria* Clarke, *Stylonurus myops* Clarke and *Pterygotus globiceps* C. & R.) modeled by Doctor Ruedemann himself, and models illustrating the internal structure of the shells of cephalopods—also made

by him. Doctor Ruedemann was not quite satisfied with the effect of the plaster models, and, to see if he could get them to look more lifelike, had one or two painted in natural colors by G. S. Barkentin, draftsman at the time, who was very clever at this kind of work. The results more than fulfilled expectations and all the models were treated in this way.

The Eusarcus Group was the first restoration group used in the Museum, and as this was at a time when we were still in the plaster stage, the two restorations of Eusarcus in this group are of plaster. The first restorations in wax made by Mr Marchand were the primitive fishes, *Bothriolepis* and *Cephalaspis,* that now form a small group in the Hall of Vertebrate Paleontology. These wax restorations were found so much more satisfactory than those in plaster that it was decided to continue to use them. A case showing the restoration of Portage life was the next to appear, then the restoration case showing Helderberg life, and finally the Upper Devonian Sponge case. It is planned to add to the restorations a Cambrian, Ordovician and Silurian case to complete our series of "period" cases. A crinoid case bringing together different types of Devonian crinoids, regardless of formation, just as was done in the case of the Upper Devonian sponges, to show the wealth of the New York Devonian rocks in these forms, was already discussed with the artist before the Devonian Forest group was started; and more of this type of case will be added as time and money and room permit.

In one of the graptolite cases fossils and restorations have been combined very effectively; and this idea could be well carried out with other groups. The slabs containing the graptolites are arranged at the bottom of the case, the floor of which is a very much flattened pyramid. Wax restorations of the most important generic groups shown on the slabs are suspended at various heights from the glass top of the case.

The latest, also the largest and most elaborate restoration undertaken by the Museum is the Upper Devonian (Gilboa) Forest group. This group has a width of about 36 feet, a depth from 16 to 18 feet, and a height around 25 to 30 feet. The restoration was executed by Henri Marchand and his two sons, Georges and Paul, under the supervision of Miss Goldring. In this group a new departure was made: in the foreground (idealized, of course) a reproduction of the actual conditions under which the fossil trees were found is shown; in the background a restoration of the forest as it might have appeared in the height of its glory. The two ideas have been successfully worked out and beautifully combined by

the artist. This group not only serves its purpose as a scientific reproduction but through the painting in the background, especially, deserves to be numbered among works of art.

Not all of the restoration cases were set up at once, as one continuous piece of work; but the groups were assembled piece by piece, as the Museum could afford it. Money was not always available, and the Museum owes much to the late Director, Dr John M. Clarke, for supporting these restorations and for his untiring efforts to obtain the money for them, if not from the State, then as gifts from private individuals. To carry out all our plans fully, we shall need the new State Museum which was the unfulfilled dream of our late Director.

Figure 10 First case illustrating "What is a Fossil?"

Figure 11 Second case illustrating "What is a Fossil?"

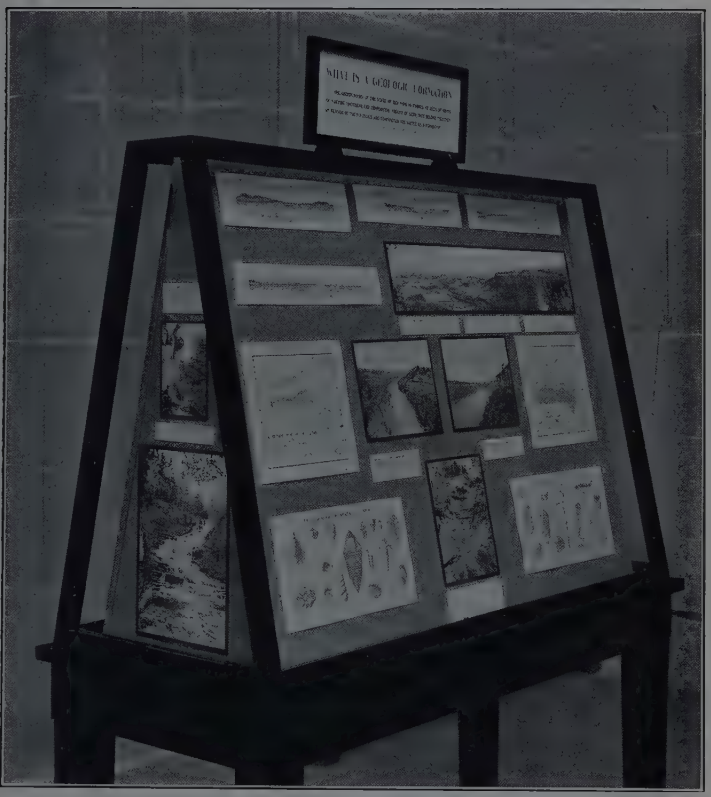


Figure 12 Rear and end view of case illustrating "What is a Geologic Formation?"

Figure 13 Case containing selected slabs with graptolites and restorations of graptolites in wax. When completed, it will show a phylogenetic series of the principal genera.

Figure 14 One side of a special exhibit case, illustrating the marine invasion of the post-glacial Champlain period in the Lake Champlain basin. Arranged by Miss Goldring.

Figure 15 The Gilboa Group, showing the rocks with the three horizons of fossil stumps in front, and the restoration of the forest

THE THACHER WAMPUM BELTS OF THE NEW YORK STATE MUSEUM

By Noah T. Clarke

Archeologist, New York State Museum

With the accession of four rare Iroquois wampum belts that have been willed to the State of New York by Emma Treadwell Thacher, widow of John Boyd Thacher of Albany, the State Museum collection of wampum is now considered to excel any group of this nature in existence. Although there are larger collections, the wampum belts owned by the State are declared to be of greater historical value than those in any other collection.

In this connection it is recalled that at a council of the Onondaga Nation held on February 26, 1898, The University of the State of New York was elected wampum keeper of the Onondaga Nation with power "to get possession of and to safely keep forever all wampums of the Onondaga Nation and the Five Nations and Six Nations and each of them." At the same time a resolution was adopted stating that "the Onondaga Nation does hereby sell to The University of the State of New York all wampums for $500" and the University was made the "attorney in fact" of the Onondaga Nation to recover such wampums by suit or otherwise in the name of the Onondaga Nation or any of the subscribing chiefs or sachems.

The election to this office and the transfer of the wampum were confirmed by an action of the Board of Regents on March 22, 1898, and by an act of the Legislature in 1899. The actual transfer was made during appropriate exercises at the thirty-sixth annual Convocation of The University of the State of New York held in the Senate Chamber of the State Capitol, June 27–29, 1898.

The four wampum belts recently acquired by the State Museum are known as the Hiawatha Belt, the Washington Covenant Belt, the Wampum to Mark the First Sight of Pale Faces, and the Champlain Belt. These four belts were purchased by Mr Thacher for $500 on March 24, 1893. In 1890 when a census of the Indians of New York State was being taken under the direction of Colonel Henry B. Carrington of Hyde Park, Mass., he learned that these wampums were in the possession of Thomas Webster, an Onondaga Indian. Desiring to have them preserved in a safe place, Colonel Carrington obtained permission of Webster to dispose of them. Since the Federal Government would not purchase them, Colonel

Carrington bought them for himself. He later disposed of them to the Rev. Dr Oliver Crane of Boston who placed them on exhibition in the Boston Art Museum with the hope that they would be purchased by that institution. Lack of funds, however, prevented this. Declining to sell them to Yale University for $800, since he believed they should be in the possession of New York State, Doctor Crane permitted their exhibition by the State of New York at the Columbian Exposition. John Boyd Thacher and Senator Donald McNaughton were members of the Board of Commissioners in charge of the preparation of this exposition. Learning that there was no state appropriation for the purchase of the belts and desiring to have them exhibited, Mr Thacher personally purchased them.

The name "wampum" is a term which the early colonists derived from the Algonkian word "Wampompeag," meaning a string (of shell beads). Indians were attracted to the use of shells for personal adornment by their natural beauty. On account of their thin, sharp edges they were brought into service as implements and utensils such as cups, spoons, scrapers, digging tools and knives.

Shell beads were the handiwork of the women, whose skilful hands were accustomed to the delicate and tedious operation of their manufacture. Wampum beads are small cylindrical shell beads which measure about a quarter of an inch in length and one-eighth of an inch in diameter. They were wrought from various species of shells but those made in the eastern section of the United States were cut out from those found along the Atlantic sea coast, such as the common hard shell clam (*Venus mercenaria*); the periwinkle (*Pyrula carica* and *P. canaliculata*); the whelk (*Buccinum undatum*); and fresh-water shells of the genus Unio (Bureau of American Ethnology, Bulletin 30, pt. 2, p. 904). These afforded the manufacture of two-color varieties, the white being formed from the thicker portion of the shell and the dark, or purple bead, cut from the purple spot in the clam shell.

In trade, wampum was used either in strings or loose. When loose, they were counted out and six white beads equalled in value three of the dark ones or, according to one authority, the amount of one penny. Each dark bead therefore was worth twice the amount of the white. By the string, they were measured into strands of 360 white and 180 dark beads. These were known as "fathoms" and each "fathom" was valued at 60 cents in trade.

Shell beads, or wampum, besides their use as necklaces and for purposes of exchange, were used in strings in public transactions of various nature and significance. By stringing in different order or

color combinations, a definite idea or thought could be conveyed or recorded and this, in turn, could be interpreted without confusion. White beads in themselves when used in ritual or ceremony, conveyed the idea of peace, health and harmony; the dark or purple beads when used alone in ceremonies, denoted the idea of sorrow, death, mourning and hostility. White beads were sometimes dyed red to signify the declaration of war or used as an invitation to friends to join them in war.

The wampum belt was another product of these white and purple shell beads. These beads were strung on twisted threads made from the inner bark of the elm tree and fashioned into mats or belts by working parallel lines of beads over strips of buckskin wound with shreds of deer sinew. A variety of symbolic designs were thought out and incorporated in the manufacture of these belts as a means of recording important events, in the ratification of treaties and, in some cases, to guarantee proposals made by one people to another.

Hiawatha Belt

One of the most important and valuable of these belts (Figure 16) in existence is the Iroquoian wampum belt known as the Hiawatha Belt received from Mrs Thacher's estate. This is in the form of a purple beaded mat 21½ inches long and 38 beads in width, or 10½ inches. A symbolic design in white beads has been worked in along its length and consists of four hollow squares on either side of a figure of a heart (tree) which occupies the center.

The belt itself is considered the original record of the formation of the Iroquois League, when representatives sat at the great council to ratify the Union of the Five Nations. The exact age of this belt is unknown, but Colonel Carrington has said that it is "the official memorial of the organization of the Iroquois Confederacy, relating back to the middle of the 16th century." The "reading" of this belt as made by Daniel and Thomas La Forte at Onondaga Castle July 19 and August 1, 1898, follows: "One heart of the Five Nations—that if any hurt of any one animal would pierce that heart then they would all feel it—all the Five Nations. This was in Hiawatha's belt. That they are a united people. This is the original Hiawatha belt—a record of the first agreement to make the League."

Under section 60 of the original Iroquois Code (Emblematical Union Compact) of the Great Binding Law, found in New York State Museum Bulletin 184, page 47, reference is made to the inter-

pretation of the designs on this belt. "The first of the squares on the left represents the Mohawk Nation and its territory; the second square on the left and the one near the heart, represents the Oneida Nation and its territory; the white heart in the middle represents the Onondaga Nation and its territory, and also means that the heart of the Five Nations is single in its loyalty to the Great Peace, that the Great Peace is lodged in the heart (meaning the Onondaga Confederate Lords), and that the Council Fire is to burn there for the Five Nations, and further, it means that the authority is given to advance the cause of peace whereby hostile nations out of the Confederacy shall cease warfare; the white square to the right of the heart represents the Cayuga Nation and its territory and the fourth and last square represents the Seneca Nation and its territory."

"White shall here symbolize that no evil or jealous thoughts shall creep into the minds of the Lords while in council under the Great Peace. White the emblem of peace, love, charity and equity surrounds and guards the Five Nations."

In reversing the belt, the figure of the "heart" in the center assumes the appearance of a tree and at the same time brings the geographical position of the Five Nations in the correct order on the belt. A figure of a tree might well represent the Onondaga Nation as the Onondagas were designated to keep the council fire and it was under the Great Tree of Light that the nations met in council.

Washington Covenant Belt

Another most valuable and unique historical wampum belt (Figure 17) of the Thacher collection is that known as the Washington Covenant Belt. It is reputed to be unsurpassed in the excellence of its construction and it was the belt most highly prized by the wampum keepers of the Onondaga Nation. It is so called by reason of the fact that during the presidency of George Washington it was used as a covenant of peace between the 13 original states which he represented and the Six Nations of the Iroquois.

The belt measures 6 feet 3½ inches in length and has 15 rows of beads across its width, or 5¼ inches. It includes a total of about ten thousand beads. The symbolic figures of 15 men with outstretched arms and clasped hands extend along its length. In the center is a figure of a house, from the roof of which extends a projecting shelter for the two men standing on either side. These two figures may be considered to be the Keepers of the East and West Doors respectively of the Iroquoian Long House who are

acting as guards to the open door of the effigy of the pale face house, or the National Capitol Building. The other remaining 13 figures, signifying the 13 original colonies, are joined in unity by the clasped hands. The designs are woven in the dark or purple beads on a solid white beaded field which denotes peace and friendship.

Wampum to Commemorate First Sight of Pale Faces

The third belt (Figure 18) in this collection is 28 inches long and 13 beads in width, or 3½ inches. It is woven on buckskin thongs with a white background bearing four groups of three purple beaded diagonal lines. It was made by the Iroquois to commemorate "the sight of the first pale faces." It is not known whether this refers to the first sight of Spaniards, French or Dutch. John Buck, who was an Onondaga chief and once wampum keeper, remarked that diagonal stripes across a belt were symbols of agreement that the tribe giving the belt would help the Six Nations in war. These were props, or supports, for the Long House; the symbol of the confederacy. In this sense the diagonal lines may be considered to signify the willingness of support to the whites by the Indians.

Champlain Wampum Belt

The last belt (Figure 19) in this remarkable group is 39½ inches long and has seven rows of beads to form its width, 2 inches. It is practically a duplicate of one already in the State Museum collection. Both belts are woven with purple beaded backgrounds carrying a series of five white beaded circles across the length. At each end for a length of an inch are alternating rows of white and purple beads. The belt referred to as being in the State collection is known as the General Eli S. Parker belt and signifies the strength and unity of the Five Nations. As General Parker was a principal sachem (Rodiyanersooh) of the Senecas, he held this belt by right of his title. The "reading" of the Thacher belt as given by Daniel and Thomas La Forte at Onondaga Castle, July 19 and August 1, 1898, is as follows: "Represents a sorrow meeting of the Five Nations. If a misfortune happen: if little boys and girls were taken and one killed—to consider what should be done for remedy that misfortune—a tooth for a tooth, an eye for an eye. This is a Hiawatha Belt. This belt is used when meeting of that kind is called." A label on this belt states that it commemorates the excursion of Samuel Champlain into the country of the Iroquois in 1609.

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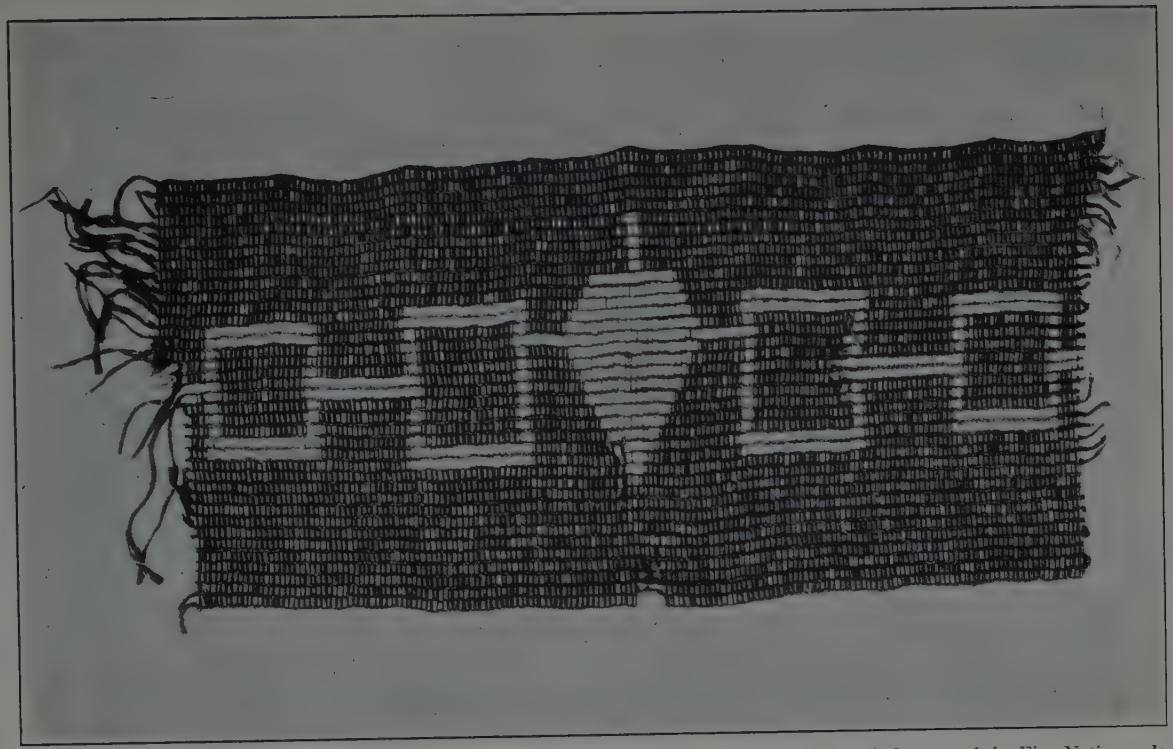

Figure 16 The Hiawatha Belt. Considered the original record of the Formation of the Iroquois League of the Five Nations. It is one of the most important and valuable wampum belts in existence.

Figure 17 The Washington Covenant Belt. Used during the presidency of George Washington as a covenant of peace between the Thirteen Original Colonies and the Six Nations of the Iroquois. This is one of the finest examples of workmanship of this nature.

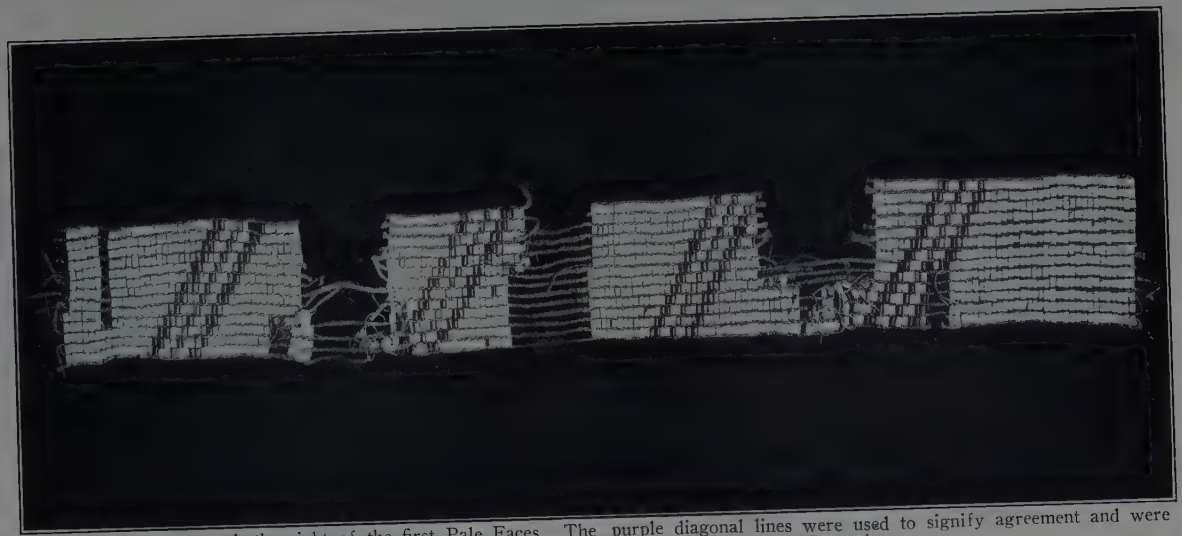

Figure 18 Belt to mark the sight of the first Pale Faces. The purple diagonal lines were used to signify agreement and were symbols of props or supports to the Long House of the Iroquois.

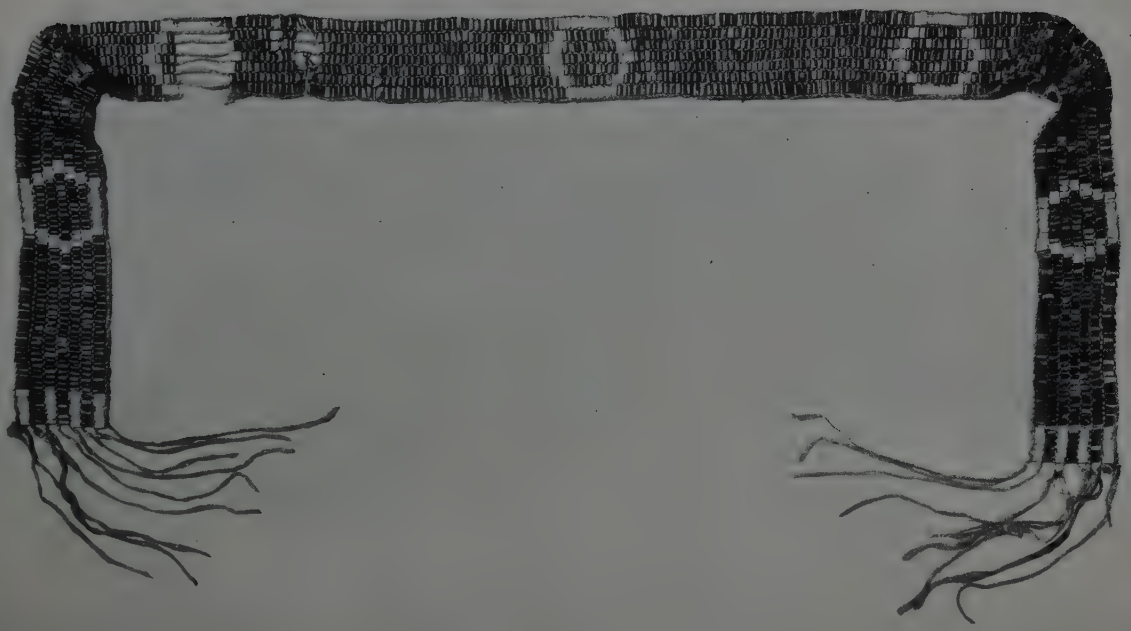

Figure 19 The Champlain Belt. The five white circles symbolized the Five Nations of the Iroquois, into whose country Champlain penetrated in 1609.

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INDEX

Accessions, 8; list of, 29–34
Adams, Charles C., Importance of preserving wilderness conditions, 37–46; bibliography, 35
Administrative organization, 9
Allegany School of Natural History, 11
Animals, 18
Appropriations, 26
Archeological collection, 14
Archeology, 18
Attendance, 8, 12, 27

Beauchamp, William M., cited, 58
Bibliography, 58; of the staff, 35
Bishop, S. C., bibliography, 35
Budget, 25
Building, new, 28

Champlain wampum belt, 57
Clarke, John M., cited, 58
Clarke, Noah T., Thacher wampum belts, 53–57
Collections, condition of, 7, 13
Colleges, relation of Museum to, 12
Converse, Harriet Maxwell, cited, 58
Cooperation with state and other organizations, 8, 9
Crosby, C. R., bibliography, 35

Drafting, 24

Exhibitions, condition of, 7, 13

Felt, E. P., bibliography, 35
Financial summary, 25
Fossils, making fossils popular in the State Museum, 47–51

Geology, 17
Gifts, exempt from federal taxation, 23
Goldring, Winifred, making fossils popular in the State Museum, 47–51; bibliography, 35

Hartnagel, C. A., bibliography, 36
Hiawatha belt, 55
Historical collections, 14
Hodge, F. W., cited, 58

Insects, 17

Kemp, Dr James Furman, death, 19

Lectures and publicity, 23

Museum as a bureau of information, 13

Needs of the Museum, 28
New York State, cited, 58
New York State Supreme Court, cited, 58

Paleontological work, 17
Paleontology, making fossils popular in the State Museum, 47–51
Parker, Arthur C., cited, 58
Photography, 24
Plants, 18
Printing, 24
Publications and their storage, 23
Publicity and lectures, 23

Reservations, loss of, 19; importance of preserving wilderness conditions, 37–46
Restored areas, 21
Ruedemann, Rudolf, making fossils popular in the State Museum, 47–51; bibliography, 36

Schools, relation of Museum to, 12
Staff of the museum, 7, 16; bibliography, 35
Statistical summary, 25
Storeroom, 24

Thacher wampum belts, 53–57

U. S. Department of the Interior, cited, 58
University of the State of New York, cited, 58

Virgin conditions, 20

Walcott, Dr Charles D., death, 19
Wampum belts, 53–57
Washington covenant belt, 56
Wilderness conditions, importance of preserving, 37–46

Young, Douglas B., death, 19